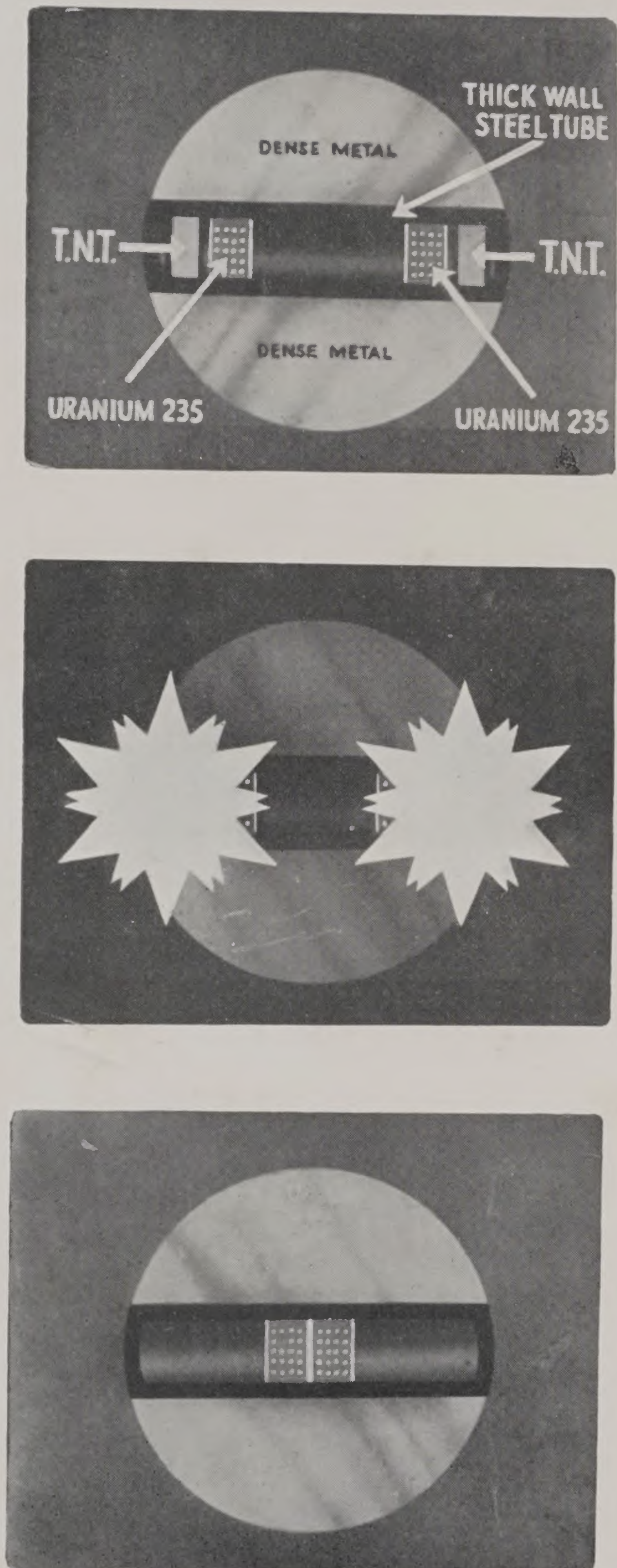
SCIENCE IN FILMS

I



(a)

(b)

(c)

ATOMIC ENERGY: Three shots from the animated diagram sequence showing (*a*) two Uranium 235 masses of less than critical size, separated from one another; (*b*) explosion of T.N.T. causes them to approach; and (*c*) when they meet the combination is over the critical size, and atomic energy is liberated.

(*Metropolitan-Vickers Electrical Co., Ltd., Great Britain.*)

Frontispiece

SCIENCE IN FILMS

I

A World Review and Reference Book

Edited by

BLODWEN LLOYD

M.Sc., Ph.D.

With Illustrations

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PREFACE

THERE are several ways to truth; the scientific way is one of these. There are many ways of perceiving a scientific truth, but the simplest is the visual one. Even primitive plants and animals are sensitive to light, and it is not surprising that more complicated organisms such as ourselves react so readily to the stimulus of vision. This very sensitivity to visual objects creates a sensitivity also to movements of such objects, and objects moving in space move also in time. In this lies the essence of ciné-perception.

Seeing becomes believing, but that belief was strained when man's primitive sketches, scratched on stone, were adapted to make a first alphabet. The first alphabet was a picture-alphabet, and it is only because these pictures became stylised and simplified beyond visual comprehension that proficiency in the literary arts has become essential for scholarship, and that learning has hitherto leaned on literacy.

But the coming of the ciné-film, and of the ciné-sound-film, has provided a means of expounding not only the fanciful for entertainment, but also of the factual for instruction, record and research. The evolution of the ciné-film from a medium for entertainment to a serious medium for exposition has taken fifty years, a short time compared with the several centuries before mystery plays became reputable drama, or before ballads became respected poesy.

Today, however, the film has become an accepted medium for the dissemination of knowledge; UNO and UNESCO have their film organisations; Universities and State educational departments have their film or audio-visual units for the promotion of educational cinematography; and the U.S.S.R. has recently established a Ministry of Cinematography. Ciné-film has thus arrived in the world of knowledge; the scholastic disciplines of the bibliophile are being supplemented by more facile methods of acquiring knowledge, and, therefrom, understanding. Perhaps this very facility in visual learning may

engender in the scholar a facile sciolism which could in no way enhance thoughtful progress in understanding. This remains to be determined in the coming decades.

But at present the factual film is in increasing demand, and therefore is increasingly made and used. Its uses range from the serious lecture films for the pedagogue, documentary films with a message, and the genteel propaganda of State-sponsored films, to the unabashed sales attack of the frankly advertising films.

To distinguish the scientific film among these, it will be at least prudent to try to delimit it; it may be regarded as a factual film dealing with scientific topics, or a strictly scientific treatment of another topic. It is useful to distinguish the scientific film from the documentary. The latter, under twenty years of the influence of John Grierson and his school, has developed potently. It is a particularly British development, and so also to a certain extent is the scientific film in its more popular aspects at least. But whereas the documentary film "tries to be right", the scientific film more prosaically tries not to be wrong. Science cannot deal in absolute rectitude, but only in calculable errors. The documentary film may be fanciful, but the scientific film must be factual in scope; the former may be missionary in approach, but the latter must be dispassionate. The differences are of manner rather than of matter, though the material content often determines the utility or acceptability of a film for presentation to a particular audience.

Notwithstanding these wide ideological differences, there still remains a common ground of scientific fact on which such films are based, and which separate them from the novelette film of the theatrical cinema; it is with the former that this book deals. But even in factual non-theatrical films we are confronted with the difficulty in classification which arises from the varying interpretation of the very word science, from country to country, and from thinker to thinker. So for the purposes of this book the concept of what constitutes a scientific film must necessarily be rather wider than a strictly scientific viewpoint would dictate, and must therefore range from simple presentation of facts for mass information, to more abstruse exposition for the specialist.

A proper concept of the scientific film must wait upon a correct apprehension of what constitutes science. It must also wait upon a correct appreciation of what constitutes a ciné-film, and whether film activities require a great deal of ancillary matter, such as the sound-track, the disc-recording, the "still", the "blow up" and other devices for purposes varying from commercial advertisement to visual aids in teaching. Clearly where a ciné-film requires strong supporting adventitious matter of this kind, the need for ciné-film for a particular purpose cannot be very great, and its use can only be regarded as factitious, or at least subsidiary.

Notwithstanding these difficulties in delimitation of the topic of this book, the scientific film has been here in one form or another for fifty years. In these fifty years much has been accomplished, and something has been written. It is time, therefore, for some documentation of the subject, both for the users of the scientific film today and for the historians of the subject who will no doubt come forward in due time. This, therefore, is a first book of review and reference on the scientific film.

Its aim is to present a full picture of scientific film activities and achievements to the present date. It is intended for the informed public, for those scientists who see in the film a new medium for exposition and research, and for those film workers who see in science a new way of social life which should be shown on the screen.

The review sections deal with some particular aspects of the scientific film, and it is hoped in succeeding editions to include reviews of other branches of science such as agriculture and engineering, and a further selection of illustrations from current scientific films. It is hoped also to secure reviews contributed from other countries as they develop their scientific film activities.

The reference sections have been compiled from data collected from many sources of many kinds; as far as possible, they have been summarised for uniformity of presentation, though some difficulty has been experienced in accurate delimitation, for example, of State-sponsored organisations from the learned and professional bodies. An even greater difficulty has arisen in distinguishing film makers and distributors, and in making due reference to film sponsors as distinct

from commercial film makers. It may be that such difficulties have not always been satisfactorily resolved in the text; for any such inadvertent errors, or possible omissions, the editor and the publishers make their apologies, and invite notification of any errors, so that they may be rectified in future editions. As far as possible, details have been obtained either from official sources or direct from the individuals or organisations named. Indeed, it is only by the ready and prompt co-operation received from all the donors of information that it has been possible to produce this book in a reasonable time.

In many cases correspondents have most helpfully provided suggestions beyond the province of the questions asked, and in this way have made easier the collection of data in a field where the documentation has hitherto been scattered and incomplete. There may be in some countries organisations who would have provided information had they been invited to do so; to these we tender our regrets, and our hopes that they will send data for inclusion in succeeding issues of this book.

In almost all cases, also, the data were provided with scientific impartiality, and assisted greatly in the efforts of the editor to ensure that the reference section should be a dispassionate digest, without undue eulogy or captious comment.

To all those who have so willingly assisted with information, illustrations and suggestions, the editor and publishers make grateful acknowledgements. It is almost invidious to attempt to name, except by way of what the statisticians call random sampling; and while the final responsibility for accuracy rests with us, we have had special occasion to be grateful, among many others, to the following: Embassies and Legations situated in London, State offices of Education, Information and Film in many countries, as well as State-sponsored organisations such as the National Film Board (Canada), Film Polski (Poland), and the Film Division of the Union of South Africa; many organisations in the United States, such as the American College of Surgeons, Ampro Corporation, Castle Films Inc., Eastman Kodak Co., Industrial Sanitation Research Foundation, and the Society for Visual Education; many official, professional and industrial bodies which have been at pains to provide not only information, but illustrations: the Central

Office of Information, Ministries of Agriculture, Education, Supply, the Department of Scientific and Industrial Research, Association of Special Libraries and Information Bureaux, Society for Cultural Relations with the U.S.S.R.; and those many friends and colleagues in various fields whose amicable good offices have so generously exceeded what might have been expected: Mr. Oliver Bell, British Film Institute; Mr. C. Elliot, Director, and Miss M. Smith, Secretary, Scottish Film Council; Mr. Arthur Elton, Film Centre; Dr. R. A. Fairthorne; Dr. O. Keeslar, California; Dr. Roger Manvell; Mr. Parker, Association of Specialised Film Producers; and Mr. Sinclair Road.

Two particular acknowledgements must be made for very detailed assistance: the Scientific Film Association, especially its Honorary Secretaries, Mr. Michaelis and his successor, Miss Jeanne Urquhart, and the Honorary Secretary of its International Films Committee, Mr. Denys Parsons, with whom information was exchanged frequently; and Lt.-Commander H. R. Mills, Director, Science Services, British Council, who, with his colleagues in London and overseas, provided much of the reference material and made this work so much easier to accomplish. UNESCO, through their Film and Natural Sciences Divisions, showed an encouraging interest in the development of this project, and assisted with much valuable information and many helpful suggestions. For sage counsel in the general plan of the work, Dr. W. Kerr, C.B.E., is offered our grateful acknowledgements.

The work of collecting, compiling and arrangement was greatly furthered by the sedulous secretarial assistance, in particular, of Mrs. A. Maclaren; and for the manful compilation of the subject index I am indebted to Mr. Dewi Williams.

Thus the editor can only seek comfort in the dictum *qui facit per alia facit per se*; and although this book bears only one editorial name, this can only be regarded as a piece of literary imagery which this preface attempts to correct, by distributing in advance what credit there may be, while retaining in prospect the responsibility for what errors or omissions may in due time be disclosed.

January, 1948.

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LIST OF ILLUSTRATIONS

(*The sources of these illustrations are fully acknowledged on each plate to those organizations and film makers who have so kindly provided them.*)

REVIEW

THE SCIENTIFIC FILM TODAY

BY THE EDITOR

THE CINÉ-FILM, like the world of letters, may deal in fact or fantasy; but the ciné-film began as a mechanical curiosity and evolved as an entertainment, though it was many years before imaginative creativeness had produced a recognisable film art. The development of such a film art waited on the technical evolution of cinema equipment; as a matter of history, the first ciné-film was—necessarily—a factual one. Ciné-projection preceded ciné-photography, and the zoopraxiscope of Muybridge, showing static serial pictures of galloping horses in a manner which induced ciné-perception, is usually regarded as a first device for visual ciné-perception, though undoubtedly the traumatope of Dr. Paris or Dr. Fitton (1825), and the "fenaquisdoscopio" of Dr. Planteaux (1833), were legitimate precursors, just as the "photographic revolver" of Dr. Janssen (1874), and the praxinoscope of Dr. Reynaud (1877), were logical successors to Muybridge (Aragão, 1946).

Friese-Greene's patent of perforated celluloid film, Edison's kinetographic camera and his projection kinetoscope, mark the end of the primitive period, and the beginning of the formative period in respect of apparatus for ciné-photography and projection. By 1895 ciné-films were shown in Paris by Lumière, and in 1896 at the Finsbury Technical College, London, by Robert Paul, a scientific instrument maker; in Lisbon by Aurelio da Paz dos Reis, and in the United States by Francis Jenkins. From now onwards the time-scale for perception has been conquered, and an illusion of the passage of much time in less time (which is basic cinematography) has become a controllable mechanism in human visual physiology. From this date also, development passes out of the hands of the early artificers and experimental scientists; technical improvements of course continue, but the next twenty years are marked by exploitation (in its best sense) for entertainment.

We must regretfully pass over the development of the ciné-film as an entertainment and as an expression of aesthetic art, and confine ourselves to the development of the scientific film as used for instruction, research, record and information.

Films for instruction are chiefly on scientific or technical topics, presumably because other topics are not so ciné-photogenic in the instructional field. In the classroom, scientific films may be used for the major teaching objectives in science: (i) an understanding of scientific principles, (ii) for inculcation of the elements of scientific method, and (iii) to develop a scientific attitude (see Keeslar, 1946). From the administrative point of view, the use of films for this purpose is only justifiable where other methods are less satisfactory; this is largely because of the cost. England and Wales have about one projector to twenty schools, whereas Austria has about one to five schools (Scientific Film Association Report, 1947); pre-war Germany made a levy for films from each school child, and educational films were made at a profit (Wollenberg). A leading producer of educational films in Britain has stated that, until 10,000 projectors are installed, it is not economic to make films for classrooms.

It follows, therefore, that a scientific film designed for education in the schools should have a projector-potential of 10,000, or it should be subsidised as part of an educational programme. In the United States there are the State and County Bureaux of Audio-Visual Aids; in countries such as Czechoslovakia, Poland and the U.S.S.R., there are national schemes in operation, and in Britain, administrative machinery has been set up within the Ministry of Education, while Local Education Authorities are expanding their activities—the London County Council bought fifty projectors in 1947 at a cost of £10,000.

But in many countries the production of scientific films, except on a very small scale, is not undertaken, and is not likely to be undertaken, for very sound economic reasons. Such countries may expect to look to their neighbours, as several Latin American republics now look to the United States, and as China looks to Britain and the United States, for ciné material. But the difficulty of transfer of film stock across national frontiers is a major one, as anyone who has had to negotiate this will agree. In due time, we may look to UNESCO

to stabilise and seek implementation of the recommendations of the Convention on Educational Films (Geneva, 1936).

From the teachers' point of view, opinion is not yet stabilised on such matters as the relative merits of sound and silent films, which are the best films, what are the best teaching conditions for using them. The Science Masters' Association (Britain, 1945) agreed that the best school equipment would be a sound projector in the school hall, and one or two silent machines for classroom use. The National Education Association (U.S.A.) has set up a Department of Visual Instruction under Dr. Walter Wittich, and an Educational Film Research Institute formed in 1945 in California under the presidency of Dr. A. G. Goons. Experimental work is also proceeding in Scotland under the Scottish Educational Film Association, in England under the North Hertfordshire Teachers' Visual Aids Committee, to name only a few such organisations.

But the teacher is concerned not only with experimental work on science teaching by films; he must also have some critical knowledge of the films available, and such critical knowledge is as yet rather hard to attain. In spite of the derisive dictum of Disraeli that critics are those who have failed in art, it must be conceded that effective critics can only be those who bring a mature mind and a wide experience to reinforce their judgement. But the whole art, technique and practice of cinematography is young, and maturity of perception and appraisal is hardly to be expected now. The juvenilia of the documentary and factual critics, and even the flippancies of some of the aesthetic critics, are therefore at this stage forgivable, and in educational circles the difficulty of securing good appraisal has been overcome by the formation of critic committees. Even so, a corporate judgement may be fallible, particularly where teacher, film maker, and scientific expert are not adequately represented, or where critical minds are devitalised by cumbrous appraisal procedures and schedules.

A Commission on Motion Pictures in Education has been set up by eight major producing companies in the United States. Under the direction of Dr. George Zook, and with funds of $100,000, some 15,000 commercially produced films have been reviewed, and a selection of 2,000 films made. Similar reviewing schemes have been maintained in Britain

by the British Film Institute, Scottish Film Council and Scottish Educational Film Association, and the Scientific Film Association and Association of Scientific Workers Films Committee.

Turning now to the scientific film and the scholar of school age, we must note that he is growing up in an age where the visual impact of the street poster and the propaganda picture, and the auditory impact of the radio, make him by that much less susceptible to the literary impact of the newspaper and of his school books. But the world in which he lives is becoming increasingly technological and, as technology is so closely related to science, it is of some importance that his scholastic scientific learning, and his social scientific learning, shall in some measure follow comparable paths. It is known that the young frequent the cinema more than the old (Alexander, 1946); and with potential audiences in Britain, of the four and a half million or so children between the ages of seven and fourteen years, the formation of the Advisory Council on Children's Entertainment Films is a welcome step. Within the school, the British Film Institute have loaned about 15,000 films weekly to school audiences totalling about 450,000 weekly, in 1943.

In the Universities and comparable institutions, scientific films are variously used. Production departments connected with Universities are by no means common, and the department of Biophotography of Rutgers University, U.S.A., the studio at Zyrardow in connection with the University of Lodz, Poland, are rare examples. More commonly, films are made on an amateur basis by scientists requiring this medium for exposition or record of particular pieces of research. Such films, not edited in the professional manner, are used chiefly by their originators as lecture adjuncts. Examples are Professor Lloyd's film on insectivorous plants (McGill University, Montreal, Canada), the films of the Sir William Dunn School of Pathology, Oxford (see p. 144), and those of Professor Pijper in bacteriology at the University of Pretoria, South Africa. The outstanding use of films for research and record at University level was in Germany, where an institute was maintained wholly for that purpose, and is now resuming its activities under the direction of Dr. Wolf (see p. 126).

On the whole, however, it seems that the Universities of the world have played so far only a minor part in the

production of scientific films, except where particular workers in particular fields have the personal interest, the funds and the encouragement to do so.

In the use of scientific film, Universities and comparable institutions encourage this chiefly by extra-mural activities. In France there are ciné-clubs (not exclusively scientific) attached to almost every University; in Britain some of the Scientific Film Societies meet under the aegis of the neighbouring University, but the locally-made film does not travel far. It is a great pity that many unusual and informative films of value are encysted in the departments that produce them, being often made on 16-mm. reversal stock, and no copies made. However, with the formation of the Cambridge University Film Council, and, more recently, a Universities Film Council in Britain, and a Parliamentary indication that it is open to Universities to make application for grants of money for this particular purpose, we may look to greater development in this field also.

Instruction in film technique at University level is hardly fully organised yet, except in countries such as the U.S.A., France and the U.S.S.R., where there are training institutions for this purpose. In Britain there is rather little, and what training there is is chiefly on cinema critique rather than on cinema technique. The extra-mural department of the University of Manchester arranged cinema courses in 1945, and there are occasional short courses at the Regent Street Polytechnic, London, and at the Technical Institute, Harrow, Middlesex. In the United States, as disclosed by a recent survey by the Society of Motion Picture Engineers (1946), the numbers of courses in Universities and similar establishments were as follows: Cinematography 5, Photography 21, Sound Recording 5, Film Editing 3, Projection 5, Distribution 4, Economics 3, and Ciné-processing 1. This society concluded that instruction in the technique of kinematography was not as yet fully provided for in the U.S.A., and that it seemed necessary there to accord some measure of professional status rather than of craftsmanship to students in these categories.

The cautious attitude of the Universities is comprehensible, since, being literate, they are not dependent for their learning, or even their knowledge, on visual exposition.

In industry, however, where so much has to be learnt by

example rather than by precept, and where training in manipulative dexterity depends so much on ocular demonstration, films are being increasingly used. One American industrial concern has recently ordered 5,000 projectors for its own use in 1947; the handsomely edited "Index of Training Films" (*Business Screen*, 1947) lists 2,000 titles, and the industrial list of the Scientific Film Association in Britain both show the lively use of scientific and technical films in the industrial world. From other evidence available, it seems that the U.S.A., Canada and Britain are the major producers and users of industrial films for training and information—as well, of course, as for advertisement.

The world's largest producer and user of films for training during the war years, is the United States Government. By the end of 1943, its War Department had 10,200 training films, and 11,890 training "shorts". Many of these are now released for use by educational and other establishments. A similar policy in Britain would no doubt release much valuable material for scientific, industrial and technical training.

Research organisations, professional and learned bodies use ciné-film chiefly as a tool for research and record rather than for exposition, though the latter is by no means neglected, as the information in the reference section of this book reveals.

The production of ciné-film for research is a rather more esoteric affair though some films are of great general interest, in addition to their particular specialist value. Examples are the films of Dr. Comandon and M. de Fonbrune of the Pasteur Institute, showing the implantation of a nucleus of one amoeba into the body of another; another showing the attack by a soil-fungus on Nematode worms; another from the Kodak Laboratories showing by infra-red photography the response of the human to visible light, and another from the same laboratories showing, by polarised light, some phenomena of photo-elasticity in transparent plastic models.

These are documented as far as possible in the reference section of this book, and reviewed in their special aspects in succeeding chapters, so that, as a first step in the full and useful application of the scientific film in all fields, the available information shall be collected comprehensively. The dual problem of securing a film and projecting a film varies from

country to country, but National Film Libraries are not uncommon, and the Library of Congress, Washington, proposes to accord to the screen "a comparable recognition to that heretofore given to the printed word". Once these national archives are established from country to country, and fully in contact one with another, the way will be clear for a fuller documentation, and for collating of the now scattered data of the published work of perhaps the last two decades. Here the scientific abstracting journals can play a large part; already *Biological Abstracts* has a section dealing with films in Immunology and Microbiology, and an extension of this practice in other fields would make information about films available.

The peoples of the world are already film-minded; the scholars and technicians of the world are becoming so, if with less urgency. The professional knowledge of the latter has often in the past been locked away from the peoples, in the complexities of the written word; but in a simpler form it can be exposed on the ciné-screen, so that the people of this increasingly technological world may know something of the man-made powers which control or modify their way of life.

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SCIENTIFIC FILM AND THE PEOPLES

ROGER SHATTUCK,
Film Section, UNESCO

THE MILITARY development of gunpowder and the invention of printing were both fifteenth-century phenomena for Europe. It is worth noting that an astonishingly similar pair of developments belongs to the twentieth century: atomic fission and the film. There is little evidence that printing was ever called into the service of gunpowder in order to exploit either its destructive or constructive power. The medium of printing was itself considered as explosive a force as gunpowder, and there was little effort to use the one in order to prevent the abuse of the other. Today, however, we have the contrasting situation of the new media of mass communication being called immediately to the service of atomic power. Since 1945 there have been fully a dozen films made upon the potentialities of this world-shaking discovery. They are directed towards the whole of the immense cinema public, and this article will emphasise the point that the term "scientific film" must today stress these films which reach all of society and not simply the scientists.

It is no accident that the new media of public information, especially the film, have so quickly brought growing segments of the world to a new degree of self-consciousness—consciousness of the challenge of the future. The frightening news-reel sequences of the Bikini atom test have made complacency impossible for those who have seen them, and this state of affairs never applied on such a scale during the fifteenth century when gunpowder was one factor in the destruction of feudalism.

The unfortunate aspects of our amazing new world consciousness is the fact that it has led in some cases to what has been called a "failure of nerve". The people of the world, frightened by the spectre of atomic power, begin to suspect

the minds and methods which brought it into existence. That this reaction is understandable does not mean that it is right, but the problem is thus posed both for the scientist and for the man who is occupied with informing the public.

But both these men have begun to express themselves with vigour, and happily they began before the recent shattering impacts of atomic explosions. The scientists have sensed, since the beginning of the century, the need for presenting to the world the dangers as well as the benefits of their work. When recently it has been suggested that research be halted in certain fields, they have realised that their very way of life is threatened, even if still distantly. Seeing the possibility of a "failure of nerve" because of what science has brought into the world, the scientist has almost universally accepted responsibility for his work and its applications.

In assuming this role, the scientist has had to face the problem of popularising his work. The media of mass communications, and among them the film, are immediately called upon because they are basically means of publication. This is one of the strongest points made in recent writing on the documentary film: that the film medium is by nature both art and public information. It is of all means of publication the most flexible and that which reaches the widest audience. Thus, it is exactly suited to the purpose of the scientist in popularising his field. But as was revealed at the recent UNESCO Conference on the "Popularisation of Science and its Social Implications", it is not easy to determine just what aspects of science should be "published". With only one or two exceptions, the members of the Conference tended to assume that it was enough to employ the all-embracing word "science". The individual connotations were understood to be in not too great conflict. However, in subsequent work which UNESCO has been doing in preparing a catalogue of films on the popularisation of science, three categories have emerged. For a complete picture, science must be presented with attention to all three, and they are submitted here as a tentative definition for the purpose of the public information worker.

1. Science is a body of knowledge, a system of facts, all of which are ultimately relevant to our daily lives.

2. Science is a methodology, a manner of thought and investigation. It is not a method of which control has been lost so as to produce monstrous creations; it is a method which produces beneficial results when it is intelligently applied.

3. Science is a force in society and history; and this fact is not outside the sphere of science. The problems which scientific discoveries admittedly create in the world must themselves be considered scientifically—i.e., with knowledge of relevant facts and according to a method.

We have, then, science as knowledge, as method, and as a social force; it is incomplete without any one of these three concepts or aspects. Since the beginning of the century, films have been made in all three categories, but the first has received most attention. The principal example is the classroom film, which is usually unsatisfactory for the purposes of the popularisation of science. It tends to represent an isolated set of facts whose application and significance the teacher is expected to point out within the framework of a course of study. The advanced scientific film is, likewise, inappropriate for general showing. However, there have been increasing numbers of films made which fulfil the specifications of one or more of the above categories. To an even greater extent, the conviction has increased among scientists and all clear-thinking people that films must be made giving a complete picture of science. The public, already too aware that science is a danger, must be informed that it is also, in their hands, a promise and a challenge.

As an indication of the activity in the field of popularising science through films, there is a wealth of information of which only a few suggestive items can be given here. UNESCO has taken specific interest in the problem by holding in Paris during September 1947 a conference on the popularisation of science. Among the recommendations that were submitted to the General Conference in Mexico for consideration, is one that UNESCO should stimulate production and international distribution of films designed to popularise science and its social implications. Mr. Arthur Elton, representing the British Scientific Film Association, spoke briefly about the Institut

International du Cinéma Scientifique, which was also about to meet in Paris, and he offered the co-operation of the British Scientific Film Association. Furthermore, the Film Section of UNESCO, in co-operation with the Natural Science Section, is now drawing up a catalogue of films on the popularisation of science which should be ready by the end of 1947. Its purpose, beyond that of being simply a convenient list, would be to focus efforts in the production of scientific films upon the gaps that exist in the popular presentation of science, for classroom films and highly technical films are at present occupying a great percentage of available production facilities. A third item which directly touches the popularisation of science is the project which was drawn up for approval at Mexico City: the promotion of an International Film Series. Three parts of this plan, those calling for the production of films on scientific research and discovery, on the technological skills and inventions, and on social progress, would bring into a unique distribution scheme, films made for an international audience. Of the suggested forty-eight films for 1948, at least thirteen would be in the nature of popularisation of science as it has been broadly defined here.

In addition to UNESCO's effort, there is an immense amount of concern in the scientific film in all parts of the world. Of the activities in Britain—the Scientific Film Societies and their National Association, for example—it need only be said that they are an exceptionally well-organised means of stimulating the production and distribution of scientific films for general audiences. These organisations are treated at greater length elsewhere in this book (p. 101). On an international level, they are represented in the Institut International du Cinéma Scientifique (p. 105), a body whose president is M. Korngold of Poland. It is important to note that in the proceedings of its recent meeting in Paris, the Institut was not concerned purely with highly technical films but also with those films which destroy the distance between the technically skilled researcher or engineer and the man who will ultimately be benefited or threatened by their scientific work. In recognising both the professional and public aspects of scientific film production, the Institut has established itself in a strong position.

On a national level, the problems of popular science films are fundamentally the same as for any film: sponsorship and distribution. In the countries where the film industry is a Government monopoly, the matter is reduced to the simple terms of how enlightened the Government's policy is on the subject. The three important countries in this regard are the U.S.S.R., Czechoslovakia, and Poland, and all three have very definite ideas on the use of the film to serve science. The Russian "Science and Technique" series, for instance, issues monthly a ten-minute short devoted to the latest developments in science. The producers are constantly furnished with material by scientific institutions and laboratories. There is, as well, the Moscow Studio of Technical, Scientific and Educational Films which produces features specifically designed to popularise science. It has become a matter of national pride to know the latest developments of science, not simply as they increase the comfort of living but as they pierce the secrets of life and of nature. The popular film on the experiments in the resuscitation of organisms represents fair evidence of this endeavour. In Czechoslovakia, a number of films on the natural sciences, on health and on science in agriculture are being produced and distributed, and the production of films popularising science is rightly distinguished from the production of classroom films. Poland has a similarly progressive policy, and a film has been recently completed on atomic energy. In all these three countries, the problem of distribution is solved by the very nature of the industry, and thus all their scientific films are assured a large audience.

Where private enterprise is still the structure of the film industry, the difficulties of sponsorship and distribution appear in a more complicated form. In the United States, for example, a situation has arisen where there are insufficient films to fill the important interval between the dilution of science for theatrical consumption ("Popular Science" series, "Unusual Occupations" series, etc.) and the straight classroom film, the production of which is growing and which are often of high quality. The National Government has never been in a position to sponsor more than unco-ordinated production policy which has suffered from omission as well as duplication in the total coverage of scientific film subjects. The individual

States are only beginning to sponsor films, principally on health and local development projects. Often, of course, both the Hollywood commercial product and the classroom film are exceptionally well suited for the popularisation of science, but this is not consistently true. Outstanding films of this sort have been produced by Disney, by the *March of Time*, by *Encyclopaedia Britannica* films and many other independent units. Moreover, it appears that large industrial concerns are now becoming the sponsors of an important segment of scientific films. General Motors, General Electric, Westinghouse and other large companies are distributing their films free through the Modern Talking Pictures Service in New York. They have not yet matched the public service record of the Shell Unit in England, but a glance at *Business Screen* will reveal that much is going on in this field. A further new development in the United States, and one which is a good sign in a country so lacking in similar organisations, is the establishment of the Chicago Scientific Film Society, but its functions remain vague. Non-theatrical distribution of scientific films exists on a larger scale than is usually realised and operates mainly through Universities and State Departments of Education. The most important new organisation, which is already a channel for the distribution of scientific films, is the Film Council of America. Its member councils operate partly like the British film societies; however, in the country where there is perhaps the greatest potential interest in science, the dissemination of scientific information to the public in films needs much attention both in theatrical and non-theatrical channels.

In France, where both the Government and the private concerns are engaged in making instructional and scientific films, there are roughly thirty independent documentary film units, many of them distributing a few scientific films intended for general audiences. These producers are indirectly aided by the national legislation restricting each cinema programme to only one feature. The Institut de la Cinématographic Scientifique is, in effect, the counterpart of the British Scientific Film Association, although it does not have the same local structure of scientific film societies to keep it in touch with the people. Such organisations as Atlantic Film, a unit which

pioneered in the possibilities of the scientific film, and Je Vois Tout continue to produce shorts of scientific content. Painlevé's *Le Vampire* is an example of what the French can do with a scientific film, the imagination in this case having produced a dramatic contrast of fact and superstition on a popular subject. However, the social implications of science have been explicitly treated in very few French films with the exception of those on public health.

The Scandinavian countries are generally conscious of the need of the popularisation of science through films, and since they can produce few themselves they have often adapted British or other foreign films for domestic showing. In India, the Government has been consistently active in producing films on agricultural and social change. China is producing and importing films through her Educational Film Institute which works in co-operation with the Audio-Visual Centre at Nanking University. One little known but admirable project has been faithfully carried out in Switzerland by M. J.-L. Nicolet. He has made nearly a hundred short animated films on mathematical subjects and has more recently turned his hand to the same kind of film on astronomy. The latter series is designed for general showing, and it is the tenacity of such men as M. Nicolet that will bring the scientific film to its full development.

The highly organised and directed work done by the National Film Board in Canada deserves more than passing notice. With the possible exception of Russia and Britain, Canada is the country with the most advanced official policy towards the use of film as an instrument of good government. In comparison with the films made in France, for example, the Canadian films almost always stress the social implications of the subject being treated. This is especially true of the Canadian scientific films aimed at non-specialised audiences, and the National Film Board has never committed the easy error of presenting to them isolated scientific facts simply because such facts are curious or easily filmed. Science always appears in terms of health, housing, rural developments, or some such application, and it is the soundest of policies for non-technical audiences.

But this is only a glimpse of a few activities in the production

POLAR BEAR.
(*G.-B. Instructional Ltd.*)

TAWNY OWL.
(*G.-B. Instructional Ltd.*)

KING PENGUINS.
(*G.-B. Instructional Ltd.*)

COLOUR VISION IN BUTTERFLIES: Yellow flower models attract the two species shown (*Vanessa io* and *Aglais urticae*).
(*Dr. Dora Ilse.*)

LA LIBELLULE: Emergence of the adult dragonfly.
(Réalisation Conard, Brussels.)

LA LIBELLULE: Mating of dragonflies.
(Réalisation Conard, Brussels.)

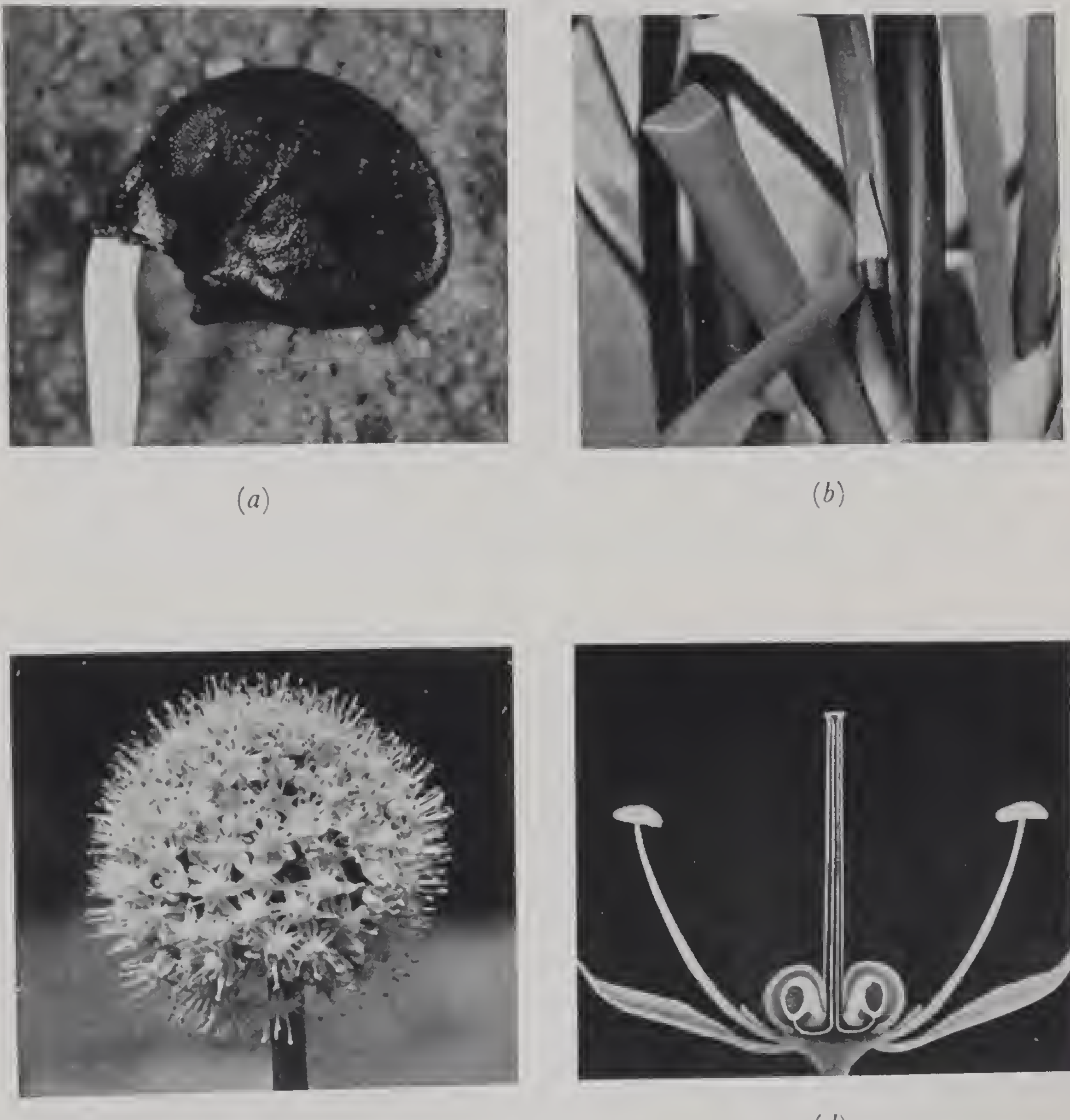
A SHOT OF A STAR-FISH (*Echinodermata*).
(*Rutgers Films, New Brunswick, U.S.A.*)

GULF OF MEXICO INVERTEBRATES: Spider crab (*Crustacea*).
(*Rutgers Films, New Brunswick, U.S.A.*)

LIFE AND SAND: Sand rat being crushed by a python (U.S.S.R.).
(Courtesy of Society for Cultural Relations with the U.S.S.R.)

THE THISTLE: Mature "parachute" fruits escaping; later, fruit is released by an elastic ring at base of parachute.
(G.-B. Instructional Ltd.)

Plate VI



(a) (b) (c) (d)

LIFE HISTORY OF THE ONION: (*a*) germinating seed, (*b*) vegetative growth, (*c*) mature flower head, and (*d*) from animated diagram sequence showing fertilisation.

(*G.-B. Instructional Ltd.; British Council.*)

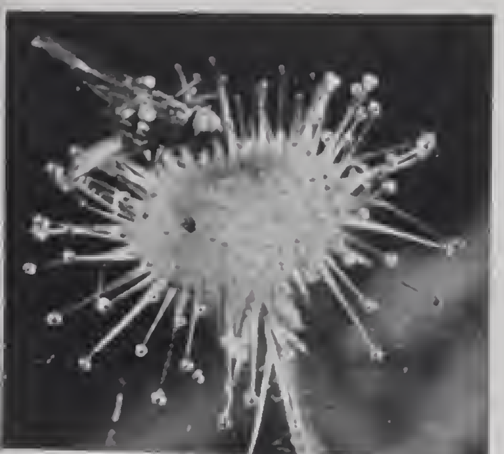
PLATE VII

(a)

(b)

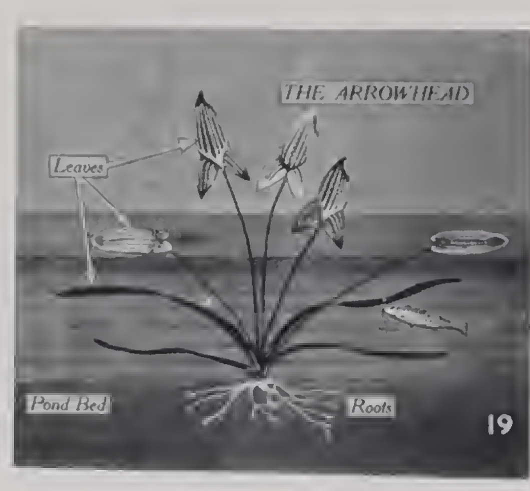
CLIMBING PLANTS: Tendrils of *Eccremocarpus* (a) before contact, and (b) after contact with support.

(*G.-B. Instructional Ltd.*)



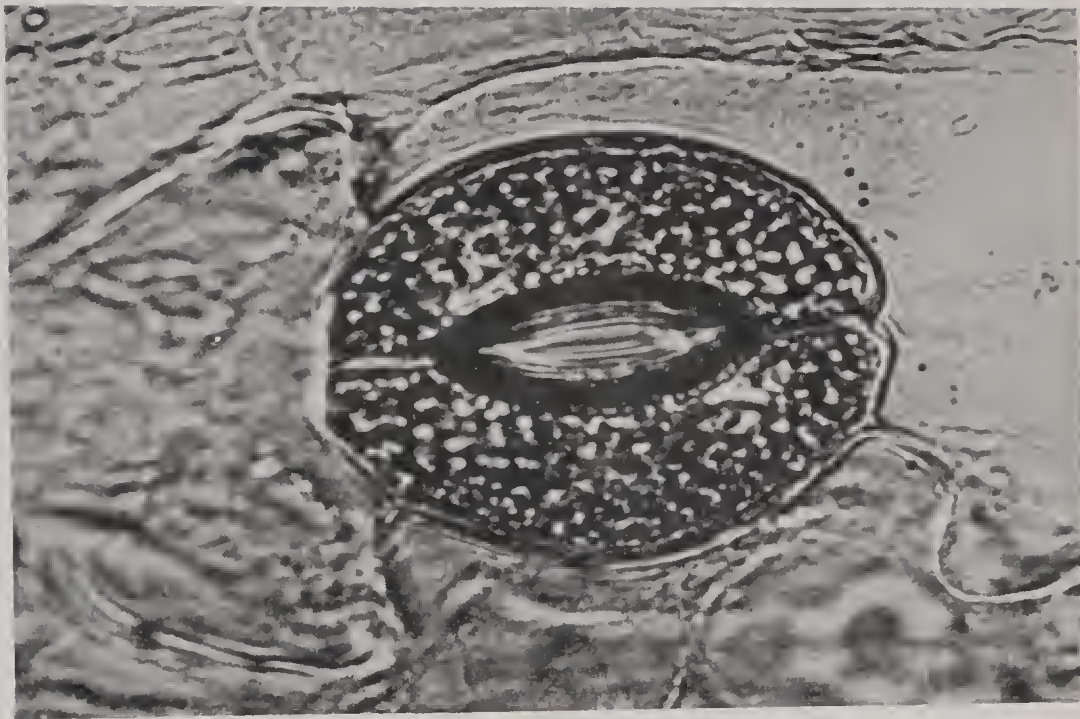
(c) INSECTIVOROUS PLANTS: Fly caught on sundew leaf (*Drosera*).

(*G.-B. Instructional Ltd.*)



(d) WATER PLANTS: Variation in shape of leaves of Arrowhead (*Sagittaria*). A frame from Unicorn Head Film Strip.

(*Voice and Vision Ltd.*)



LIFE CYCLE OF A PLANT: Cinemicro-photograph of breathing pore (*stoma*) from the surface of a leaf.

(*G.-B. Instructional Ltd.*)

LIFE HISTORY OF THE FERN: Prothallus of bracken (*Pteris*), showing early cell divisions and two transparent rhizoids.

(*G.-B. Instructional Ltd.*)

and distribution of scientific film. The peoples of the world are obviously receiving no consistent picture of science and its role in the world, but nevertheless the task of informing them is beginning. With such varied agents of sponsorship as Governments, private industry, independent film units, educational institutions and non-profit scientific and health organisations, it is natural that the world's scientific films should be uneven in quality and emphasis. But in every case these films benefit from the apparently limitless flexibility of a visual presentation of science. Complicated laboratory experiments can be filmed in such a way as to hold the interest of a non-scientific audience which has never had the opportunity to come near such equipment.

This advantage of the film, however, in reaching peoples whose educational opportunities have been small, is clear. There is a less obvious and perhaps slightly ironic role for the scientific film to play; that of bringing full scientific awareness to those who live and work in close proximity to the products of a scientific civilisation. The number of people in the world engaged in driving cars, talking on telephones, or using plastics is immense; yet it is *their* ignorance of the processes underlying these everyday things that is the most abysmal. The only more flagrant ignorance is that of the scientist who delivers to the world momentous discoveries and declines to acknowledge any responsibility for their effects. There is the popular Frankenstein story and the less-known story of Alfred Nobel's troublesome conscience to illustrate the latter condition; the former is vividly illustrated by the modern profession of an aeroplane pilot. A man can be taught to fly an aeroplane mechanically or by rote with no knowledge of why he performs the complicated procedures, but he is helpless in a crisis. No pilot is competent unless he understands the fundamentals of aero-dynamics and the internal combustion engine. Similarly, no person is fully prepared mentally to inhabit the modern world unless he has some understanding of say, radio, of his own bodily functions and of a tremendous number of other topics. This greatest of educational jobs can be undertaken by well-made and carefully planned scientific films.

Because film-making is such a highly-skilled profession requiring so many different talents, and because the presentation

of science to the public is one of the most difficult of public information jobs, the popular scientific film is a synthetic product requiring immense experience. The film which succeeds in popularising science is the rare meeting ground of the scientist and the general public through the film maker, and there is no need for any distinctions to be made here about the artistic nature of these films. If they are lucidly made they will be aesthetically satisfactory. For example, the Czech film, *Rhythm*, the American film, *The River*, the British *Transfer of Power*, and any number of animated mathematical films are true works of art. A butterfly or a crystal formation is not a difficult subject for artistic treatment.

Thus far scientific film has for the most part devoted itself to the wide field of biology, for preliminary phases in this science are mostly descriptive. The film, being visual, is almost entirely satisfactory for purposes of description, but there are greater difficulties in approaching the science of chemistry or physics. The expanding resources of the animated film will probably prove to be the most profitable in this connection.

But the future techniques of the scientific film are discussed by experts in other sections of this book. In respect to bringing science to the people, the organisation and emphasis of each film is of equal importance to its technique. Specifically, films popularising science must break out of their confinement to the first of the above-mentioned categories: the presentation of scientific facts and principles. The most valuable scientific films for general audiences would treat the method of science or point out its social implications. They should, indeed, occasionally practise a reversal of direction. Instead of invariably starting with the factual material of science, films could approach science directly as a method or as a force in society and illustrate the point by drawing on the content of science. Practically no such films exist on the method of science; a few exist with principal stress on the social aspects of science. It is the purpose of this paper, and also obliquely of the catalogue that UNESCO is assembling, to point out this lack in popular scientific films. A series of films considering specifically the scientific method—pure and applied experimentation, the formation and verification of theories, the

significance of errors and the supreme importance of technique in experiment—is in many ways the greatest need among films popularising science. The illustrative material in such a series should be taken from several branches of science in order to show that methods of research are the same in principle in all fields of inquiry. Films are also needed which deal with the history of science, the developments of its technique and the growth of specialisation; well suited to these purposes would be films on the lives of great scientists which do not distort the relationship between their professional work and their private dramas. Without these measures the scientist might suffer a fate of isolation similar to that which has haunted the modern artist. And it might be doubted whether our civilisation could survive with both its artists and its scientists on the verge of alienation.

By now it should be apparent that the attitudes of the scientist and of the film-maker today are far different from those of the fifteenth-century exploiters of gunpowder and the printers in the same era. The scientist examines the implications of his work almost simultaneously with the performance of that work; the film-maker "publishes" his films with an eye principally to what public they can and will reach. The men in these two occupations have found that their co-operation is essential to the condition of the peoples in the world today. The great contribution of the film which popularises science is toward the release of man from the too prevalent fate of being overwhelmed by the intricacy of contemporary life. Science among the peoples is neither medicine nor poison. It is a staple item in the diet which the minds of all men must receive.

(*The foregoing is a personal contribution from the author, and the views expressed are not necessarily the official views of UNESCO.*)

VISUAL PHYSIOLOGY AND THE CINÉ-FILM

PROFESSOR GEORGE BELL,
University College, Dundee.

The enthusiasm with which the Services used the film during the war is a great tribute to the value of this medium in teaching and in demonstrating applied science. The conditions under which projection took place were usually far from ideal from the point of view of vision, acoustics or ventilation. In time of peace when the urgency of the situation has declined it is right that we should review the work that has been done to define, so far as possible, the conditions necessary for satisfactory projection and reception of moving pictures. Another important reason for considering the situation carefully is the high cost of the apparatus. It seems unlikely that more than a small amount of ciné equipment will be released as surplus by the Forces. The shortage of projectors is the greatest obstacle to the supply of scientific films (Boland, 1946). It seems inevitable, then, that there will be a delay in obtaining projectors, but this may be an advantage in that we shall buy projectors suited to local conditions instead of adapting cheaper, but probably unsuitable outfits. Let us consider then what are the best conditions for viewing a motion picture.

Design of the Cinema.

The ideal conditions for projecting and viewing motion pictures cannot be exactly defined. They must be assessed on the basis of the judgements of a sufficiently large group of observers. The difficulty occurs in other branches of applied physiology, such as hearing and ventilation, but it need not trouble us greatly since we are concerned here with observations and not with their interpretation. It will be readily agreed that the standards of quality in educational projection ought, if anything, to be higher than those in the theatrical motion picture field. Fortunately we can rely on a report on

"Recommended procedure and equipment specifications for educational 16 mm. projection" made by a Committee of the Society of Motion Picture Engineers (1941). These recommendations form the basis of the following account of the technical design of the cinema. Once a suitable room has been chosen the steps in the selection of equipment are to decide: (i) the size of the screen, (ii) the type of screen, and (iii) the light output of the projector. These requirements are not entirely independent of one another, as will be shown.

The Size of the Screen and the Seating Area.

The minimum size of the screen is determined by the finding that a distance equal to six times the width of the screen is the greatest distance at which all of the details in the picture can be easily seen. A position too near the screen is not to be recommended because the picture on the screen lacks sharpness even when it is accurately focused. The want of definition is of course due to the great magnification of the very small image on the film. This results in eye strain in the spectators, presumably because the ciliary muscles are continually in action in an attempt to adjust the accommodation to bring the unsharp images into focus. At the front of the room where the visual angle subtended by the screen is large the eye movements needed to follow the action are excessive and apt to produce fatigue. These excessive movements may, moreover, reveal flicker not seen when the gaze is maintained. Even when the eyes are stationary the flicker due to the intermittent projection of the successive frames of the film on the screen is much less troublesome when the spectator is farther away from the screen. Thus experiments with 16 mm. projectors have shown that when run at 24 frames per second with a two-bladed shutter (i.e. a 48 c.p.s. flicker) the threshold light intensity for just perceptible flicker rises four times when the viewing distance increases from one screen width to six screen widths. The critical frequency of flicker (i.e. the lowest frequency at which flicker is absent) with a constant light intensity changes with the state of dark adaptation (Lythgoe, 1940). For this reason it is important to disregard any observations on flicker made on entering the cinema; after a few minutes the eye becomes less sensitive to flicker.

The shape of the screen is fixed by the shape of the agreed frame size, viz. 4 units broad by 3 units high. A completely distortionless viewpoint cannot be obtained since it is not possible to project a picture along a beam at right angles to the screen and at the same time view it at that same angle. A considerable amount of distortion is tolerable, however, and it is not until the line from the observer to the screen is 40° from a line at right angles to the screen that distortion becomes objectionable—at this angle the screen appears to be square (Tuttle, 1933). For satisfactory viewing the angle should not exceed 30°.

The Committee therefore recommends (*a*) that a picture

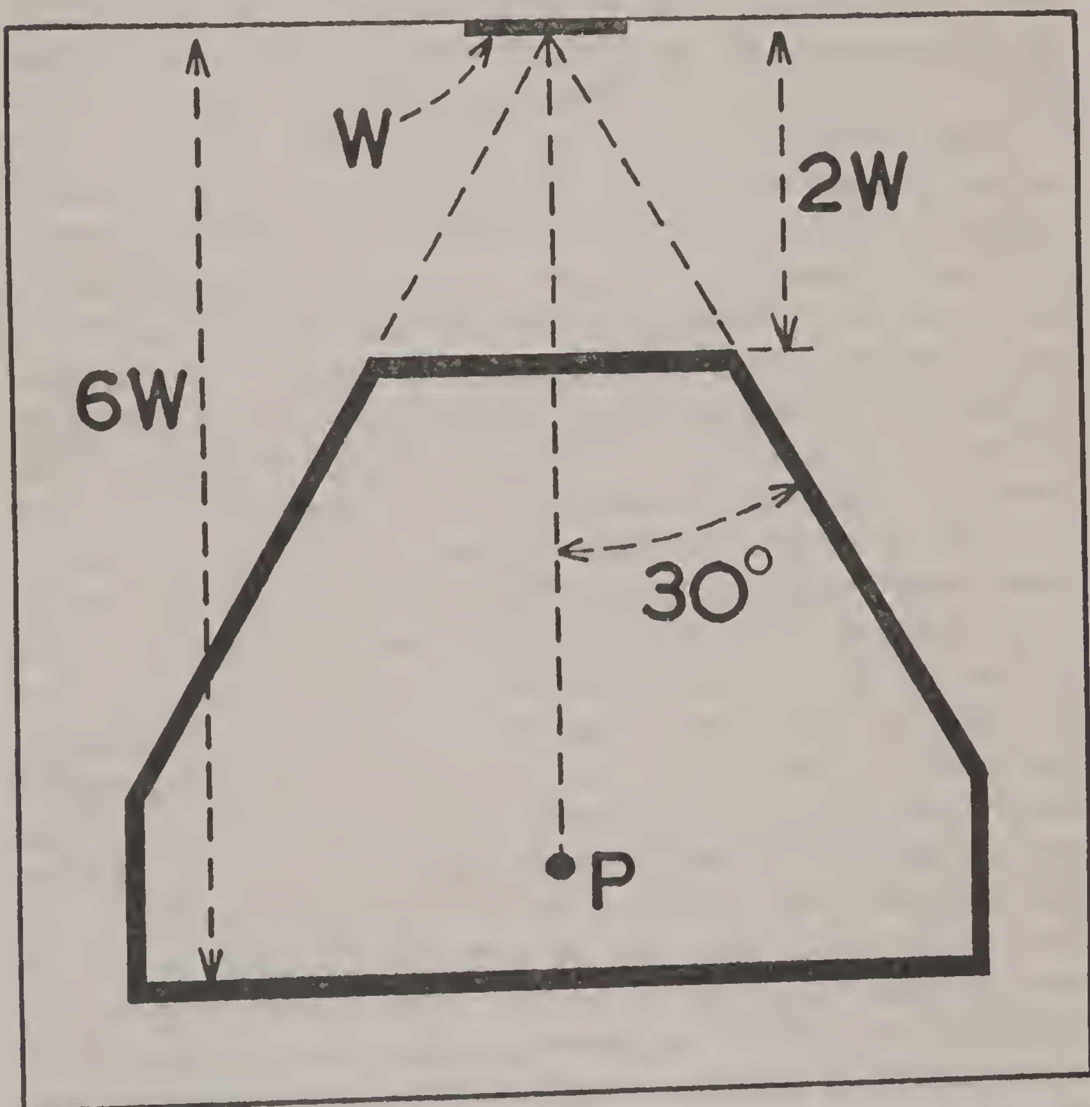


FIG. 1.—Diagram of seating arrangement of class-room with mat screen of width W. The projector is situated at P. The thick line indicates the limit of the seating area.
(Modified from diagram in the *Journal of the Society of Motion Picture Engineers.*)

width equal to one sixth of the distance from the farthest row of seats to the screen position should be adopted for class-room projection; (*b*) that no pupils should be seated closer to the screen than twice the picture width; and (*c*) that no row of seats should be longer than its distance from the screen (see Fig. 1).

There is often considerable argument in the photographic press (especially when the merits of long- and short-focus lenses are under discussion) as to the best distance to view an enlargement of a still photograph in order to obtain correct perspective. It is not generally realised—at least judging by the way most people choose a seat in a cinema—that there is a position which gives least distortion of perspective. Since most 16 mm. projectors are provided with lens of 2 in. focal length, the screen (adopting the Committee's recommendations) will be filled when the distance to the projection lens is $5\frac{1}{4}$ times the screen width. The projector and *not* the screen should be moved so that the screen is just filled. As nearly all 16 mm. pictures are taken with a 1 in. lens (or reduced from 35 mm. film, which amounts to very much the same) the visual angle subtended at the eye by an object on the screen will be the same as that subtended by the object at the camera if the observer is half-way between the projector and the screen. In other words the following rule is satisfied:

$$\frac{\textit{Distance screen to observer}}{\textit{Distance screen to projector}} = \frac{\textit{Focal length of taking lens.}}{\textit{Focal length of projecting lens.}}$$

Other positions in the seating area may give rise to error in the estimation of the relative size of objects. This is probably of no great importance (violations of perspective are either avoided by the film maker or accepted by the spectator). In the viewing of animated diagrams position is of no importance. In any case the cameraman often uses lenses of very different focal length from the standard—obviously a stationary observer cannot be in the correct position for every one. In the writer's opinion the argument in favour of using correct viewing distances are based on the naïve idea that the eye is a camera to which simple geometry can be applied (see later under phenomenal regression).

Selection of Screen Surface.

There is no doubt that a mat-surface screen made with flat white paint or fabric or rubber is much the best from the spectators' point of view and no modification of the recommendations summarised in Fig. 1 is necessary. The reflecting power of screens in different directions can be expressed in terms of a theoretical screen which reflects all the light falling on it and is equally bright at all viewing angles. Taking the coefficient of reflexion of such a screen as 1, a good mat screen will have a coefficient of ·85 along the perpendicular and ·75 to ·8 at 30° from the perpendicular. Further, no matter at what angle (up to 30°) the screen is viewed the brightest part of the screen (with no film in the projector) is not likely to be more than 25 per cent brighter than the darkest part. This difference may easily pass unobserved.

Some screens are covered with small glass beads which by reflexion and refraction throw back most of the light to the projector even when this is at an angle to the screen. For this reason the projector, when a beaded screen is used, should be located only just high enough to clear the heads of the spectators. If this is done an observer on the centre line of the room will see a picture about four times as bright (i.e. reflexion coefficient 4) as that obtained with a mat screen; 10° off the centre line the reflexion coefficient may fall to 2. If the angle of view is more than 20° from the perpendicular the screen reflects less light than a mat screen. Thus this type of screen is only suitable for a long narrow room as shown in Fig 2. If a beaded screen is viewed from two screen widths' distance it will be found whatever the angle of view that the ratio of the brightness of the brightest part to that of the darkest part (brightness ratio) is over 3; the high standard of the mat screen in this respect is not attained till the spectator is 3 or 4 screen widths away. Since a brightness ratio of over 3 is not tolerable no seat should be nearer a beaded screen than 2½ screen widths away (see Fig. 2).

Screens covered with fine particles of aluminium need only be mentioned to be condemned. The particles of metal reflect the light like so many little mirrors—the screens are often called semispecular—so that there is pronounced "hot spot"

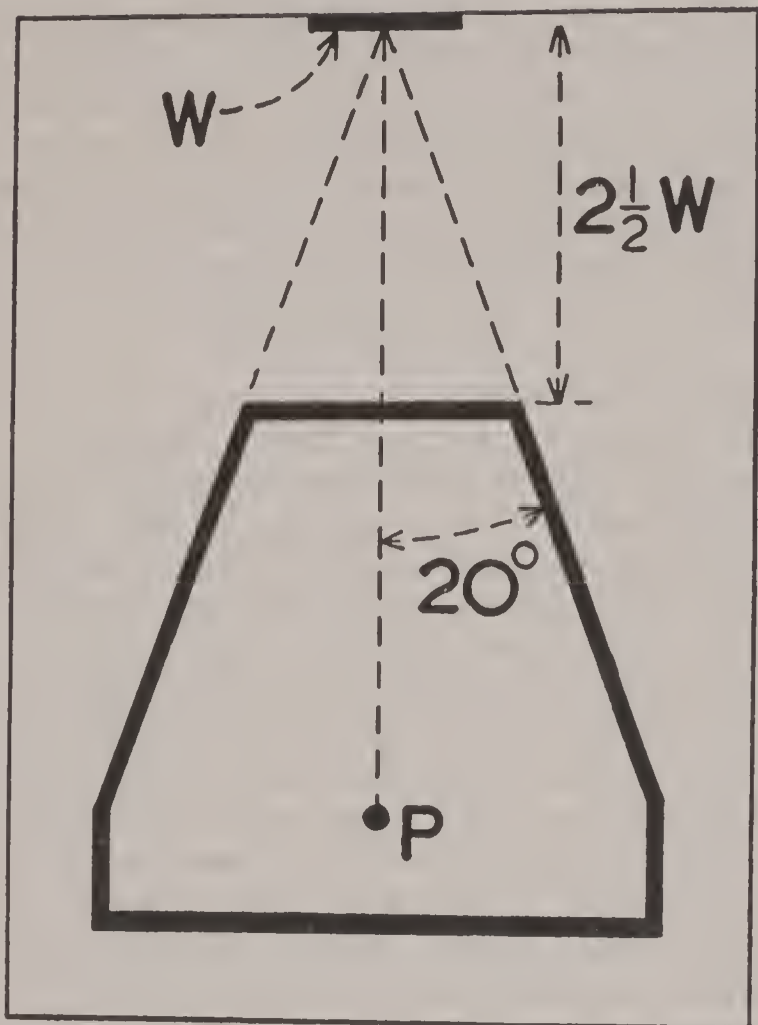


FIG. 2.—Diagram of seating arrangement for a narrow room with a beaded screen.
(Modified from diagram in the *Journal of the Society of Motion Picture Engineers.*)

near the centre of the screen for those sitting near the centre line. This spot moves over to the edge as the spectator moves away from the centre line. Thus at 20° from the projection axis the brightness ratio may easily be 10 with a reflexion coefficient of very little more than 1. Aluminium screens are colour selective and are therefore not suitable for the projection of colour films. This condemnation applies whether these screens are rough or smooth. The only place for metal surface screens is in the projection of stereoscopic films by polarised light; a mat surface destroys polarisation.

The area round the screen should be dull and featureless to prevent wandering of the attention. A grey border may be better than the more usual black one.

It is necessary to point out what is so often forgotten—screens need to be kept clean. A screen which has deteriorated may waste up to half the light falling on it. In addition the distracting effect when an image appears to move across a mottled area is considerable (Falge, 1931). Painted screens should be renewed frequently but renovation of beaded screens is by no means simple. Special tools are needed to paint the perforated screens used in front of the loud-speaker.

Light Output of the Projector.

Having decided the size and type of screen we can now decide on the projector light output which gives the optimum screen brightness (Projection Screen Brightness Committee, 1936). If the light is too weak picture quality suffers, contrast diminishes, high lights are weak and detail cannot be seen from the back of the room. If there is too much light graininess becomes evident, high lights dazzle and flicker becomes evident. It has been found by trial that the desirable screen brightness corresponds to 10 foot-lamberts[1] with the projector running without any film. Under these conditions at a speed of 24 frames per second with a two-bladed shutter there will be an objectionable 48-cycle flicker. Under normal conditions with a film running through the machine flicker is not noticeable because the brightness range on the screen is usually from 8 to 28 per cent of that obtained without the film. Brightness may often be increased without trouble from flicker by using a two-bladed shutter instead of the three-bladed one often supplied. Whether or not flicker becomes obvious depends partly on the brightness and partly on the time of the pull down of the intermittent movement. Flicker is least noticeable when the time that the screen is dark is reduced to the smallest possible fraction. Flicker and, incidentally, film wear and tear would be greatly reduced if a continuous projection method could replace the present intermittent method; the optical difficulties are, however, very serious.

[1] A lumen is the amount of light falling in one second on a unit area placed at right angles to the direction of the light at unit distance from an international candle. The foot candle is the unit of illumination equivalent to one lumen per square foot. A foot-lambert is the brightness of a surface emitting or reflecting one lumen per square foot.

The light output required from the projector can be calculated from the formula:

$$\textit{Light output in lumens} = \frac{\begin{matrix}\textit{Desired brightness} \\ \textit{in foot-lamberts}\end{matrix} \times \begin{matrix}\textit{area of screen} \\ \textit{sq. ft.}\end{matrix}}{\textit{screen reflexion coefficient}}$$

For example, if the area of a mat screen is 4 ft. × 3 ft. and coefficient is ·75 then lumens required is $\frac{10 \times 12}{\cdot 75} = 160$. It is expected that manufacturers will soon give values for the light output of their projectors. For rooms of the size of an ordinary classroom there is no difficulty in obtaining adequate brightness with incandescent lamps, but where the screen size exceeds 8 or 9 ft. arc lighting may have to be used.

The quality of the picture suffers if the room is not adequately darkened but complete darkness is neither necessary nor desirable; a general room light of 1/10th foot-candle (with which it is just possible to read newsprint) is not harmful, and may be appreciated for reasons of safety or of discipline.

The Illusion of Reality.

I do not think that anyone reviewing the progress in technique made by the film since the end of the last century could deny that each advance as it came along has secured for the audience a greater feeling of reality. The old shaking, flickering projection has disappeared; photographic quality has greatly improved and now we have colour—surely a great step towards the perfect illusion of reality. Those concerned with the technical side of film production, well aware of this trend, are pushing ahead very quickly. This progress is not the result of a popular demand for greater technical feats because mankind on the average is very accommodating and extremely uncritical. Just recall how many of us were shocked when the pictures began to talk—we were till then quite happy with our old film convention and loath to accept a new one. When colour appeared a similar reaction occurred—it was so much of a shock that the early colour pictures, e.g. Walt Disney's *Fantasia*, introduced colour very gradually—they did not

plunge into a riot of colour right away. The uncritical acceptance of the current film technique means that the vast majority of people are unaware of the limitations of the technique or of the many things necessary to attain the complete illusion of reality. The book *Film* by Rudolf Arnheim (1933) is a most interesting example of the conservative outlook. Arnheim actually welcomes the photographic and physiological restrictions of the medium: the film cannot represent Nature accurately, and the more it attempts to do so the less likely is it to be artistic. If a perfect illusion of reality were the highest aim of the pictorial arts then their supreme achievements would be battle panoramas and wax-works. I am certain that this conservative attitude to progress is quite wrong. We must go on, therefore, to find what are the physiological and psychological deficiencies of the present film technique.

The camera is as it were single-eyed, but in viewing the screen we have, as in monocular vision, clues as to the depth and distance by variations in intensity, by perspective, and by parallax. For instance, a man walking away from the camera becomes smaller, less well defined and moves across the background. A beautiful example of the exploitation of these three factors is the Ave Maria scene in Walt Disney's *Fantasia* where a group of persons carrying lanterns passes through a forest. Occasionally I have noticed that viewing the screen with two eyes gives a smaller feeling of depth than does monocular vision—perhaps because both retinal images are the same. The most efficient factor in the perception of depth is stereoscopy—this is shown clearly by the simple experiments of Washburn and Wright (1938)—and there is no doubt that if it were added to cinematography a great step forward towards the complete illusion of reality would be achieved. The cost of stereoscopy would be a very great addition to the already high cost of film production. Although methods of stereoscopic projection are in fact available (Norling, 1941; Langlands, 1943) it seems most unlikely that they will be applied to the relatively unremunerative scientific films for many years. It has always to be remembered that there is no short cut to stereoscopy. The two eyes must be presented with slightly different images of the same scene.

Because the eye is similar in construction to a camera, it is often assumed that we see the image on the retina without alteration and that vision can be examined on geometrical principles. This rather simple notion omits any reference to the brain behind the eye. If three persons, *A*, *B* and *C* are seated in a row, then *A's* retinal image of *B* is twice the size of *A's* image of *C*, but *B* does not appear to him to be twice as big as *C*. A short-focus lens in close-up photography tends to make the nose too large in full-face view; this distortion is apparent to any observer, no matter what his distance from the print, i.e. even if he is at the distance which makes the eye subtend the same visual angle as the camera lens. A long-focus lens (with the subject of necessity farther away) will produce a more pleasing result because it is as we see it. This peculiarity of the visual apparatus which gives constancy of size and form has been called by Thouless (1931a, 1931b, 1932) *phenomenal regression to the real object*. A square card lying on a table in front of us is always seen as a compromise (the phenomenal shape) between the shape calculated from the laws of geometrical perspective (the stimulus shape) and the actual square (the real shape). The images obtained in the ciné camera and the images projected on the screen are faithful renderings of the stimulus shape. Although the spectator receives a geometrically correct retinal image, he is not provided in the cinema with the normal clues of depth obtained in real life. The resulting sensation is not the same as that evoked by the actual objects. It may be better in cartoons to draw the shapes, not according to formal perspective, but nearer to the real shape, so that the resulting sensation is the same as that evoked by the actual objects. Phenomenal regression depends on clues of depth; if the illusion of depth is complete, as in stereoscopic cinematography, the image on the screen should obey the laws of formal perspective.

Another respect in which the eye differs from a camera is in its ability to neglect images which are inappropriate. The eye, like the camera, is focused accurately for only a small range (depth of focus) at any one time. Out-of-focus images are not normally seen; continuous adjustment of accommodation ensures that each plane is examined while it is in focus so that the subjective impression is that the whole depth of the

scene is in accurate focus. Out-of-focus images appearing on the screen cannot be rejected and the photographer usually contrives to avoid blurred images so far as possible. In cartoon work out-of-focus images have been avoided by multiplane photography in which successive planes are focused in turn and recorded without blurring of detail. It can be assumed that one of the greatest difficulties in producing stereoscopic films will be the limited depth of focus of the camera lens.

The attitude of the spectator and the intention of the film producer must be taken into account when considering the physiological requirements for the complete illusion of reality. Is the spectator intended to feel that he is in a room looking through a window on to the world? Or is he expected to feel that this in front of him is his own private experience and that he is actually taking part not as a passive, but rather as an active spectator who lives through all the strivings, excitements and emotions of the situation? There is no doubt that the second alternative is the aim of the producer of a dramatic film. As Eisenstein (1943) picturesquely puts it, the image planned by the author should become flesh of the flesh of the spectator's risen image. There is little doubt that the spectator often participates actively in a motion-picture show. The only objective evidence available on this is provided by Kleitman (1945) on the basis of occasional data obtained in many subjects and by analysis of multiple readings in two female subjects. Although attending a motion picture is usually looked on as a relaxation in the sense of an escape from the humdrum of existence, it is by no means a relaxation in the physiological sense. In spite of the fact that the subject remains sitting for two or more hours there is an increase in muscle tension which is shown, according to Kleitman, by a statistically significant rise in body temperature of ½ to 1° F.

If it is accepted that the answer to our second question is in the affirmative we must consider the illusion of reality in an even more personal way—viz. the part played by the proprioceptors. If we are on a ship in a storm the nerve endings in the semicircular canals are strongly stimulated and distinctly uncomfortable sensations result. Viewing a motion picture of such a situation leaves the labyrinths quite unaffected —we are reduced to passive spectators. In a street scene we

may be shown barrows being pushed uphill with obvious effort, but this gives us only a second-hand notion of the appropriate muscular sensation. It might be that a larger screen occupying a larger portion of the field of vision would help to make up for these deficiencies. So much does the scene in a film occupy the whole of our consciousness that it is not usually realised how small the screen is. At two screen widths' distance the screen subtends 28° at the eye—at six screen widths only 9°. Sometimes the camera is made to look round (pan) so that we are given a wide view; when the picture is projected we are apt to get the impression that the scenery is floating past. In viewing a real scene the eyes do not "slide" over it as in panning but they move in a series of glances. If the eye is fixed, movement of an external object from right to left causes movement of its retinal image from left to right and we are aware that the object has moved; when the eye glances from left to right, the retinal image of a stationary object moves from left to right but the object does not seem to move. There is little doubt that the failure of reciprocity shown here is due to the effect of proprioceptive impulses arising in the external eye muscles. If the camera made glancing movements the projected picture would be very unsatisfactory, since our proprioceptors would be unaffected. In the present state of physiology it is not possible to imagine how artificial but appropriate proprioceptive stimulation could be supplied to an audience (Bell and Weir, 1947).

Although the screen is so small it is important to realise that the audience see very little except that which is right in the centre of the picture. Hewer (1946) describes how Huxley and he found, during the editing of the film on the amoeba (G.B.I.), that the contractile vacuole had not been described. They looked through their material four times before they found one—eventually it was located up in the north-east corner.

Thus even if we have stereoscopy, sound and colour, we are still, because of physiological restrictions, unable to present a complete illusion of reality. It may be that if the technique for the perfect illusion were available, it would be an impossible medium because a superman would be needed to control it. We can perhaps console ourselves with the thought

that the possibilities for the presentation of scientific material are even now very great. And in the scientific film even more than in the entertainment film we can with propriety transcend reality—perhaps by altering the time scale or the magnification or even by portraying the invisible to produce completely new experience.

(*This chapter is based on an article published in the* British Medical Journal [*Bell*, 1943] *and the writer acknowledges with thanks permission to use here two diagrams from that article.*)

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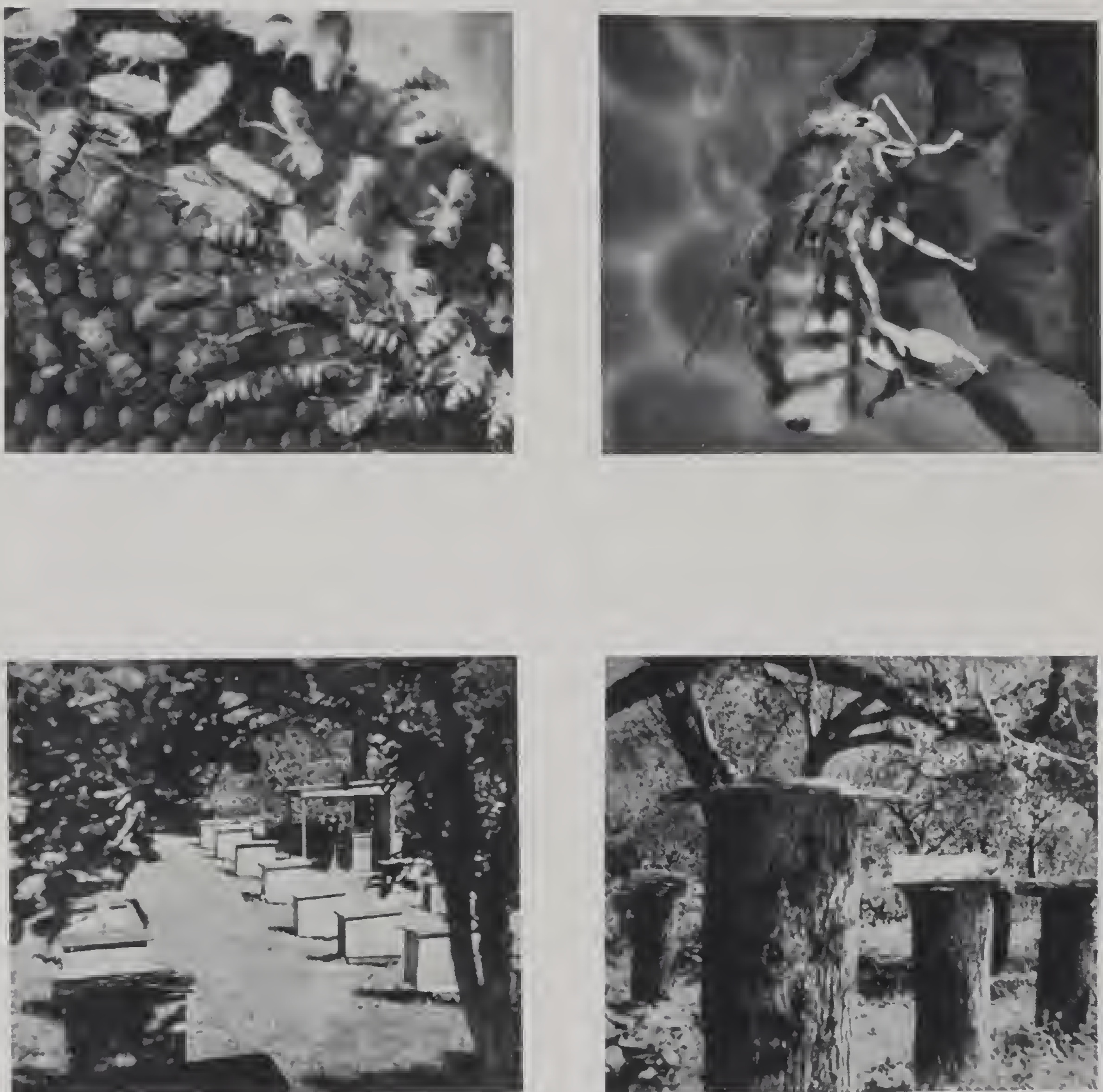
MODERN PHOTO-ENGRAVING: Finishing a Kodak fluorescent water-colour drawing.

(*Eastman Kodak Co., Rochester, N.Y., U.S.A. Courtesy of Kodak Ltd., London.*)

THE SUNNY TRIBE: Producer Vinnitsky focuses here on a beehive, by a fixed-lens technique.

(*Courtesy of Soviet Film Agency.*)

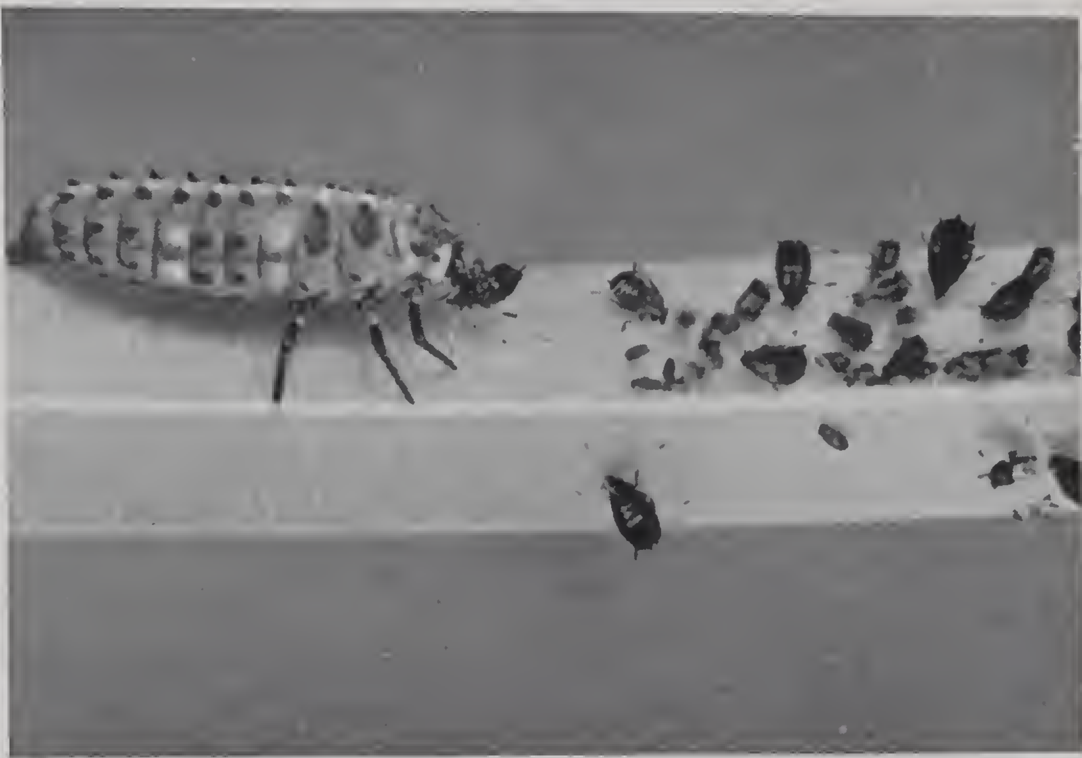
PLATE X



THE SUNNY TRIBE: Four frames from the film on the life of the bee (U.S.S.R.).
(Sovexportfilm and G.-B. Instructional Ltd.; General Film Distributors.)

THE TURN OF THE FURROW: Carting sheaves.
(Shell Petroleum Co., Ltd.)

PROTECTION OF FRUIT: Entomologist collecting apple blossoms for sawfly.
(Shell Petroleum Co., Ltd.)



PEST CONTROL: Ladybird larva eating black fly.
(*Pest Control Ltd.*)

VEGETABLE INSECTS: Close-up of a corn borer; the film illustrates in colour how research by entomologists produces better methods of control.
(*National Film Board of Canada, in co-operation with Entomology Division, Dominion Department of Agriculture.*)

STOMACH WORMS IN SHEEP: Living stomach worms, from an information film for farmers.
(*Central Office of Information.*)

STOMACH WORMS IN SHEEP: An adult stomach worm.
(*Central Office of Information.*)

FUEL AND THE TRACTOR.
(*Ford Motor Co., Ltd.*)

FISHING PARTNERS: Biologists weighing lobsters at the Quebec Marine Biological Station; the film describes work at the federal and provincial fisheries research stations of Quebec.
(*National Film Board of Canada.*)

THE CLEANING OF WALLS: Circular motion is the fastest and least tiring method of cleaning a wall; the hand moves with the same speed at all times.

(Filmstrip, Industrial Sanitation Research Foundation, U.S.A., Joseph E. Seagram and Sons, Inc.)

THE CLEANING OF WALLS: For rinsing, an up-and-down or side-to-side motion is advised, although it takes more time than circular motion.

(Filmstrip, Industrial Sanitation Research Foundation, U.S.A., Joseph E. Seagram and Sons, Inc.)

PLATE XVI

(a)

(b)

(c)

(d)

Four shots from films in household science: (*a*) MISS T.: preparing breakfast, (*b*) and (*c*) MRS. T.: care of children, (*d*) 'TWAS ON A MONDAY MORNING: ironing a dress.

(Courtesy of Electrical Association of Women, Great Britain.)

SCIENTIFIC FIELDS

A REVIEW OF BRITISH FILMS IN MEDICINE DURING THE LAST DECADE

BRIAN STANFORD, M.R.C.S., D.M.R., F.R.P.S.
Medical Photographic Consultant

A REVIEW of medical film production confined to the last ten years is set to an artificial limit, but it is useful, none the less, in that it permits a description of pre-war conditions, wartime evolution, and post-war trends. The medical film suffers from the drawbacks, in their most extreme form, inherent in the production and distribution of all teaching films. The cost of production is high, and can rarely be met by sale of copies of prints or tickets of admission: yet even the most implacable opponents of "second-hand instruction" will agree that in the teaching of medicine a film can, on occasion, be invaluable.

Medicine is a specialised subject, in which many are interested but few are knowledgeable: to that extent production by non-medical technicians is limited in value and efficiency —a criticism commonly made by teachers of all subjects who have seen films on their own speciality. Medical films made for training medical personnel can rarely employ professional actors, for slight lapses of behaviour are immediately detected by a critical professional audience; yet relatively few medically qualified people are prepared to devote the time and trouble necessary for film-making. Furthermore, the public is quick to detect insincere portrayal of illness, which is frequently over-acted on the screen; yet the genuinely sick have little desire for publicity, let alone the inconvenience and strain which film-making demands of them. Where the recording of operations or animal experiments are concerned, yet another difficulty arises: the cameraman cannot make any mistakes, for "re-takes" are impossible, and composite records compiled from several cases are unsatisfactory: the individual variation in disposition of structures is too great to allow any sense of continuity.

Yet in spite of these difficulties there has been an insistent if sporadic demand for films, which has been repeatedly

frustrated by the poor quality and unsuitable nature of the resulting products. By far the greatest number of films made up to the present time are made *ad hoc*, with no attempt at the coherent planning of a series, and often no thought even of making the film in such a manner that it can fit into an existing or proposed curriculum: an individual or a group becomes enthusiastic over an item of knowledge which is customarily accorded a few minutes' consideration during a student's curriculum, and they make on this topic a film of half an hour's duration. What hope is there that it can be used? By this criticism nearly all existing films will be found unsatisfactory.

The potential audience for medical films is limitless. Be we electrician, poet or compositor; Slav, Scots or Mexican, we have this in common: we desire to maintain in good health, and do not enjoy illness. The medical film then has all the world for its audience, for diseases recognise no boundaries and ignorance of the normal is even greater than ignorance of disease. Yet for convenience we can consider certain circumscribed audience-groups: medical students; student nurses; para-medical personnel (ward-maids, welfare workers, health visitors, almoners—people whose work brings them into contact with disease, but who are concerned with side-issues rather than the disease itself); medical technicians (masseurs, radiographers, laboratory workers, ambulance drivers); general practitioners who need to be kept up-to-date; specialist doctors who wish to inform each other of newly evolved techniques; salesmen and travellers of pharmaceutical products; and finally the great mass of the general public itself, adult and school-child. With such a need, and such an audience, it is indeed remarkable that there are not more and better films available. But we have already touched on the main obstacle: expense. None of these audiences will pay enough for films to meet the cost of production; they will not even pay enough to meet the cost of printing and distribution of copies. One library, holding over two hundred titles which were hired out at a few shillings each, was only just able to recoup each year the cost of clerical work involved in sending out the bills; the hire fee was made more as a matter of principle than for profit.

Prior to 1939 medical film production all over the world was mainly in private hands. Enthusiastic amateurs, mostly

teachers of medicine, made a film or two and showed them to their own students, but they rarely achieved any wider circulation. Some drug houses, notably in U.S.A., made films primarily designed for informing their travellers, but some of these were of little use to other groups, being too long and amorphous. The Massachusetts Institute of Technology films, made in 1924–7 although largely out of date by 1937, were still the only useful series on an elementary level, and achieved international circulation; and the late Professor Joseph de Lee made several excellent films on obstetrics, which merited a wider circulation than they achieved. In Hungary were also made a number of films on normal obstetrics, while in Germany the Reichsanstalt für Film und Bild collected a number of case-records of abnormal deliveries. In general, then, the production of films specifically designed for teaching was rudimentary. A large number of films were, however, made by specialists to illustrate lectures to their colleagues; these were little used for student teaching because they mostly portrayed unusual variants of technique. Of nursing films there were none. With the outbreak of war this situation changed radically. The belligerent countries were unable to allocate film material to amateurs, the upheaval and dispersion of hospitals made filming difficult, and student energy was used in other directions. But in wartime the health of the nation is a factor of major importance, and in many countries medical films aimed at the public became an item of Government production. This was notably the case in Britain, whose Ministry of Information started making descriptive films in 1940, but quickly changed in 1941 to films of information and exhortation. At first making only for the general public, the M.O.I., at the request of the Ministry of Health, made a useful film in 1943 for instructing doctors on the nature and treatment of scabies, which was then fast becoming a major cause of sleeplessness. Other Government films, for instance those made by the British Council, were made mainly to arouse sympathy or admiration in neutral countries. *Accident Service* and *Surgery in Chest Diseases* were broad accounts of our centralised medical services, hung rather loosely on two specialised aspects, but *Neuro-Psychiatry* was a more successful factual description; the Russians made *White Battle*

Front, an account of their military medical service, for overseas distribution. But for the most part Government films continued to be made mainly for public consumption at home. In 1944 the M.O.I. took over the film programme of the Central Council for Health Education, and inaugurated the successful series of films describing to mothers normal and diseased processes. "Your Children's Eyes", ". . . Ears", ". . . Teeth", represent a real advance in policy, whose merit is enhanced by a fine presentation of some difficulties of parent-child relationship in *Your Children and You*.

We also saw during 1944 the release of the epoch-making British I.C.I. series on "Anaesthesia", clever films planned as a unit to cover the major part of the medical student's curriculum on this subject. In the U.S.A. the Navy made an outstandingly fine series of over twenty-five films on elementary nursing procedures for training their sick-berth attendants: this series is additionally notable for the continuous emphasis on the need for caring for the comforts of the patient, a factor which is too often neglected in mechanistic demonstrations. Other fighting forces have a less happy record of medical film production. U.S., Canadian and British Air Forces made several films on the use of oxygen for high altitude flying, and also on the effects of high-speed flight. All Services also made films on V.D.; the U.S. productions mainly attempt to frighten, the Canadians rely on diagram-lectures, and the British delicately skirt the problem without giving any offence or information. Hygiene in the tropics and Arctic are also treated by films which were extensively used on board troopships: the quality of these films varies widely, but much was learnt of the reaction of the troops to the methods of presentation although regrettably little has been published of this experience.

The post-war years have so far produced little new. From U.S.A. Gesell's films of infant behaviour have become available; and the wartime experience Disney gained of making health films has culminated in a series "Health for the Americas", North and South. Some pharmaceutical houses of U.S.A. have apparently heard nothing of Service experience, and continue to sponsor lavish, costly, and useless compendiums, whose greatest feature is their length; but other firms have sponsored a number of valuable films on aspects of food-

handling hygiene, designed for restaurant staffs. In Canada several municipalities have made films for local use, and the National Film Board has produced a number of public hygiene films. South America has provided a collection of cinéradiographic studies. In Australia a National Film Board is only recently set up, and its programme is not yet known, but the postgraduate training centres have made a number of simple but useful films. South Africa has provided some excellent bacteriological studies by Professor Pijper, and a few indifferent records by missionary societies of life in leper colonies. In Russia a large number of specialist films are scheduled and many have been made; in France the Pasteur Institute has released a remarkable series of micro-biological studies, and a noteworthy film captured in Germany shows mitosis by phase contrast. There is some evidence that the Germans made a number of case-records throughout the war of follow-up studies of injuries, but these are not available. Switzerland recently completed a fine film *Krebs dem Kanker* designed to present to the public the present knowledge about cause and treatment of cancer; and Turkey has completed several films. In Britain the initiative is still largely with the Government productions, for most drug-houses have until recently been reluctant to sponsor films, and amateur production is still almost impossible for lack of film.

This is at best a sketchy survey, but its very incompleteness serves to underline an important aspect of the subject. We have already mentioned that disease is international; and many films could with great benefit be distributed beyond their country of origin. Yet few countries have an accurate centralised knowledge of the films available within their frontiers. The National Film Board of Canada has sponsored a large catalogue for that country, and in Britain the Royal Society of Medicine and the Scientific Film Association have jointly prepared and published a comprehensive catalogue which will be kept up-to-date. In the U.S.A. the American Medical Association and the American Society of Bacteriologists, amongst others, catalogue films of interest to them, but these catalogues are far from complete. Cataloguing is an important item, and it is earnestly hoped that UNESCO will assist in this work in all countries and circulate the information so recorded.

Thus far we have considered only films made for instruction—the so-called "non-theatrical" films. Yet films on medical subjects made for presentation in places of entertainment have an important influence. *Forgotten Village*, which tells of the attempt to introduce modern medicine into a primitive community; *The Citadel*, which exposes sharp practice in medicine; and biographies such as *Madame Curie* and *The Greatest Moment* are powerful factors affecting the attitude of the public to medical matters. Recently there have been a spate of entertainment films having psychiatry or a psychotic disorder as their central theme: a few have been reasonably accurate, but for the most part there is little or no attempt to portray the science of psychiatry accurately or even plausibly. These objections are perhaps obvious, but the influence of the film is far more subtle than that: every situation portrayed which has a bearing on medical matters is capable of being a factor for enlightenment or of doing harm; one has only to mention the universal attitude adopted in films towards marriage—a romantic sort of event in which a perfectly groomed star may suddenly appear with a delightful baby in her arms, and no reference to the attendant discomforts or readjustments which such an event involves—to realise how even our attitude to common events are distorted and falsified to no good purpose. Here the presentation of factual information can be of great value—it can even be "box-office", for the majority of our younger populations is technologically trained and appreciates direct information. Ciné-magazines showing how shoes are made, trees felled, and the like, now contain medical items which seem to be appreciated, and the U.S. film *Birth of a Baby*, slight as it is, has recently had a phenomenal second run in London.

It seems likely that in many countries for some years to come the production of the majority of medical teaching films will remain in the hands of private initiative and university sponsorship. Film production is also too costly for democratically elected Governments to undertake on any scale without the backing of an insistent public demand, which only wider experience of the use of the teaching film can produce. Philanthropic trusts seem exclusively interested in research, with no attention to the desirability of spreading information on the discoveries made under their auspices. This is regrettable, for

advanced medical practice is in most cases some twenty years ahead of the normal provincial practice, and centuries ahead of the public's concepts: it is undeniable that the majority of the people fail to get the best attention that could be made available to them if their doctors were kept better informed and if they were better able to carry out the precepts offered to them. It is possible that in Britain University sponsorship and production will soon commence on a large scale. In this event it is essential that the relatively limited funds available shall be spent wisely and some co-operation and co-ordination both of production and distribution must be maintained. Here the scheme elaborated by the Scientific Film Association and recently placed before the universities of Great Britain may well be adopted both on a national and an international level; the need is real and the field almost untouched. Health films for the general public will certainly remain largely a Government responsibility, and in Britain the new Health Act has virtually made the training of nurses a Government monopoly; but films made for this group will be widely applicable also to students on the one hand and mothers on the other, which raises interesting possibilities. It is hoped that films for informing general practitioners of recent advances will soon be a regular feature of medical meetings; these could well be made at Government expense and exchanged internationally. Progress in medicine is one field in which all nations are prepared to co-operate, and this opportunity for advancement of international understanding should be accepted realistically.

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See also "Medical Films" (1944), *Brit. Med. J.*, *2*, 156.

FILM AND SCIENTIFIC SYMBOLS

ROBERT FAIRTHORNE, B.Sc.

"In signs one observes an advantage in discovery which is greater when they express the exact nature of a thing briefly, and, as it were, picture it; then indeed the labour of thought is wonderfully diminished."—*Leibnitz.*

". . . they will have an instrument that will serve to exalt the intellect not less than the telescope serves to perfect their vision."—*ibid.*

THE MAIN purpose of scientific films of an educational kind is to get through the ambiguity of verbal description right to the thing in itself. For this purpose it is helped by the fact that a "real photograph" induces a certain mental sense of reality. Over and above this, the very nature of the film allows us, by editing and pictorial composition, to superimpose on the "reality", a formal structure of abstract relations—"above", "below", "before", "after", etc. Is it therefore possible to present certain facts and to marshal arguments without having recourse, in the first instance, to the spoken or written word.

Now a film, unlike a picture or a diagram, must have a definite beginning, middle and end in time, and that is true of all its parts. Although a film originates from a sequence of pictures or diagrams, it is not perceived as such a sequence, but rather as a sequence of processes or events. These can only be seen in a predetermined order, for a limited and predetermined time. To neglect this fundamental property of the film is to neglect the only way in which the film is superior to the blackboard.

The difference between a diagram and a film is that the former is purely spatial, allowing only of what may be called a synoptic order, while a film must be temporal, allowing of very little spatial arrangement, by reason of the limits of the screen and the time for viewing; but the film is capable in a very high degree, of order in time. The diagram is synoptic, a synthesis, and essentially static; the motion picture is a selective sequence, a process, and therefore essentially kinetic. Only extreme familiarity can make it possible to view a film

synoptically; when this can be done, the subject is comprehended in a way impossible by any means other than intense application and powerful imagination.

The choice between a diagram or a motion picture for presenting a scientific subject rests thus on whether it can best be treated statically or kinetically. Take, as examples, the relation between temperature and the seasons, and the Second Law of Thermodynamics. A moving picture of the motion of the mercury in a thermometer, shown alongside a calendar, is inferior to the more usual static time-temperature graph, while nothing could show better the true nature of the Second Law of Thermodynamics than the sight of a world in which it did not hold good, simply by running a film backwards. Similarly it is impossible to give such a clear idea of the shape and dimensions of an object, even with a stereoscope, as it is with a "moving camera" shot made by running the camera around the object; for while the stereoscope shows the solid from two points of view only, the film shows it from a mentally continuous sequence of points of view. Even to those with limited visual memory, this is equivalent to a *synoptic* view of a three-dimensional object; not only have we satisfied the old drawing-office request for three-dimensional tracing paper, but we have actually achieved in the motion picture a four-dimensional tracing paper.

It has been stated above that the fundamental properties of the motion picture enable us to superimpose on actuality, by selection, association, and contrast of scenes, a logical argument not based on language. This is a unique power when applied to representational images, such as photographs, but the non-representational applications should not be overlooked. A great deal of our visual experience—and all visual experience is the province of the motion picture—is non-representational, or partly so. Such, for instance, are the alphabet, maps, traffic signs, the signs of music, chemistry and mathematics, and the conventional signs and symbols of advertisements. Even the arbitrary symbols "?" "!" look really puzzled and surprised. The possibilities of using typographic symbols have been recognised and applied by Leibnitz.

The expression of argument without recourse to verbal language has been achieved in mathematical notation, but the

signs of mathematics, though by no means arbitrary in the sense that shorthand symbols are arbitrary, are logical developments from arbitrary basic signs and symbols. Also, from the very nature of mathematics, they deal not with things, but with the abstract relationships between things.

The existence of so highly developed a system together with the power inherent in the motion picture, suggest possibilities which we have as yet hardly explored. The abstract relations of mathematics might be translated into terms of processes to get over the difficulty that legitimate abstraction presents to students, and to provide a genuine *comprehension* of a problem, as distinct from the knowledge of how to solve it. Again, the established signs of mathematics, and of other branches of knowledge, might be combined with representational images, to form a method of visual argument far more powerful and less ambiguous than that shown in static applications such as "pictorial statistics". Finally, the signs of mathematics might themselves be operated kinetically and pictorially. This is not impossible, as the origins of the operational calculus and the theory of sets, to say nothing of the concepts of real and complex numbers, have shown. These last two possibilities are fascinating from a research aspect.

From the pedagogic point of view, instruction in mathematics by means of the motion picture film, will repay closer attention. First it must be made clear that there is no *a priori* reason why an educational film should only be projected in front of a class on a screen. This will always be the usual way, but it is also possible for a student to run through a film himself, in conjunction with a textbook, just as he might use a drawing or a gramophone record. This implies the existence of a small hand viewer. Such a device was marketed many years ago, for 9·5 mm. film, but at an unnecessarily high price. The kinetoscope method, i.e. flicking over the pages of a booklet, is regarded as too costly for a film of reasonable length, although such booklets have been issued in the United States for demonstrating points in biology (see *Nature*, March 2nd, 1935). If a screen and a plural audience are considered essential the following remarks still apply, provided that the films are projected more than once at each sitting.

The fundamental difficulty of mathematics lies in the fact

that it deals with abstract relations and has no interest in the *Ding in Sich*. This is surmounted by introducing abstractions in the guise of real lines, curves and areas. The practice could not be defended if it were mere argument by analogy, a habit which leads to the almost universal anthropomorphism that assumes arguments applicable to persons to be equally valid when applied to collections, institutions and nations. Fortunately this objection need not apply, since the methods of pure mathematics are not analogous to, but refinements of, the ideas applied to real figures.

Mathematical films have therefore to deal with a problem differing from that of the descriptive film, for while the latter attempts to avoid false abstraction by subordinating the structure of the film to its content, the former must subordinate the content to the structure. To achieve this, the kinetic or dramatic nature of the film is ideal. Thus while it is more obvious that a row of soldiers is a row, rather than it is composed of soldiers, it is still more obvious that a motion is periodic, even if the object in motion is not recognised.

The first decision to be made in the construction of a mathematical film is, as is the case with any educational film, whether the principle to be expounded is best presented in synoptic form, or as a process. If the former, a static diagram should be used; if the latter, the relations must be transformed into the motions of suitable units. This can always be done in many different ways, for the operations of mathematics—addition, multiplication and integration, possess an indefinite number of simple mechanical interpretations. The simplicity is from the visual point of view only; the instrument maker might well find it difficult to construct the apparatus. Nevertheless, we are at liberty to demonstrate our principles by means of a *purely visual mechanics*.

Enough has been said to indicate the gigantic possibilities in animated symbolism for educational perception of abstract scientific concepts; these have hardly yet been fully realised or explored. If no mention has been made of colour, sound and stereoscopy, it is because these cannot change the fundamental nature of the film, but can alter only the tone of the process.

FILMS AND MATHEMATICS

I. R. VESSELO, B.Sc.
Chairman, Visual Aids Sub-committee,
Mathematical Association, Gt. Britain.

ALTHOUGH some progress has been made in recent years, the mathematical film is still at the stage of first experiments. Elsewhere the film has established itself as a valuable tool in the hands of the teacher or scientific worker and a clear path shown to the film-maker for further work; but in the field of mathematics the way is still uncertain. The list of scientific films compiled by the British Film Institute and revised in 1943 contains thirteen under the head of mathematics. A more recent list issued by the Scientific Film Association (1946) raises this number to fifteen. Both lists are swollen by the inclusion of films more correctly classified under physics. Although neither list takes account of important new work, both in Great Britain and elsewhere, it is clear that the mathematical film has not yet found its place.

To some extent this is due to a late start. It was not until 1935 that the pioneer work of Fairthorne and Salt began, although some earlier work is listed. The real causes are, however, much deeper. The abstractions of mathematics seem so remote from daily life that the reluctance of all but a small band of enthusiasts to approach them is easy to understand. Yet it is this remoteness which the film sets out to conquer. A close examination of the films already made will show how far they have succeeded, and may help those whose work lies ahead.

Present mathematical films fall into several distinct categories. The simplest group set out to animate the text-book, following and illuminating time-honoured methods or arguments without addition. The boldest group present the material from an entirely new angle, in a manner not possible in a text-book, or through any medium other than the film.

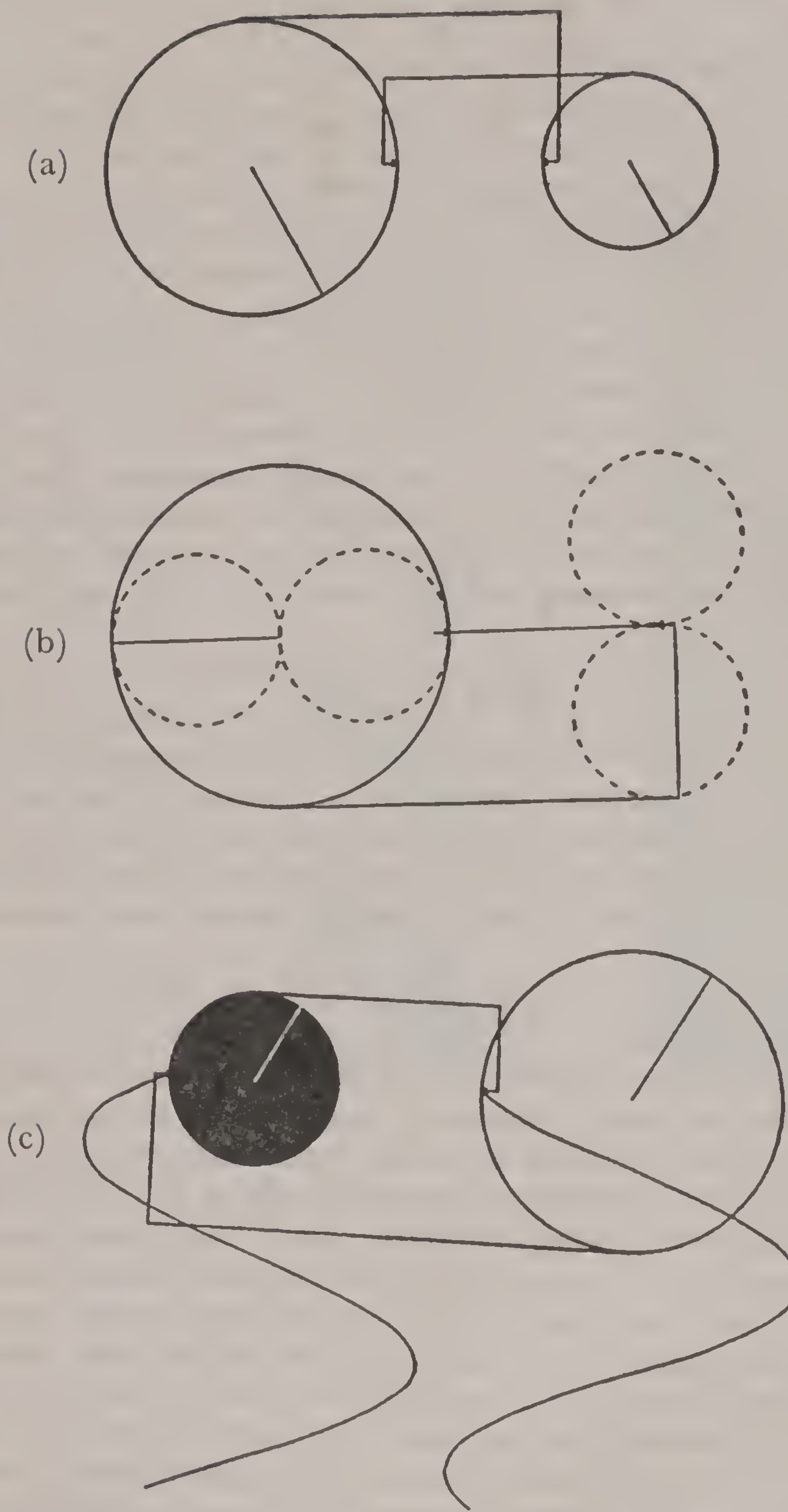


FIG. 3.—Shot from $x+\ddot{x}=0$, (a) varying disc, (b) the loci of the ends of the rotating radii, (c) the harmonic curve (Fairthorne and Salt). See pp. 48 and 51.

A more recent growth is the film which aims at appreciation by the use of applications drawn from the environment, bringing the mathematics into contact with real life.

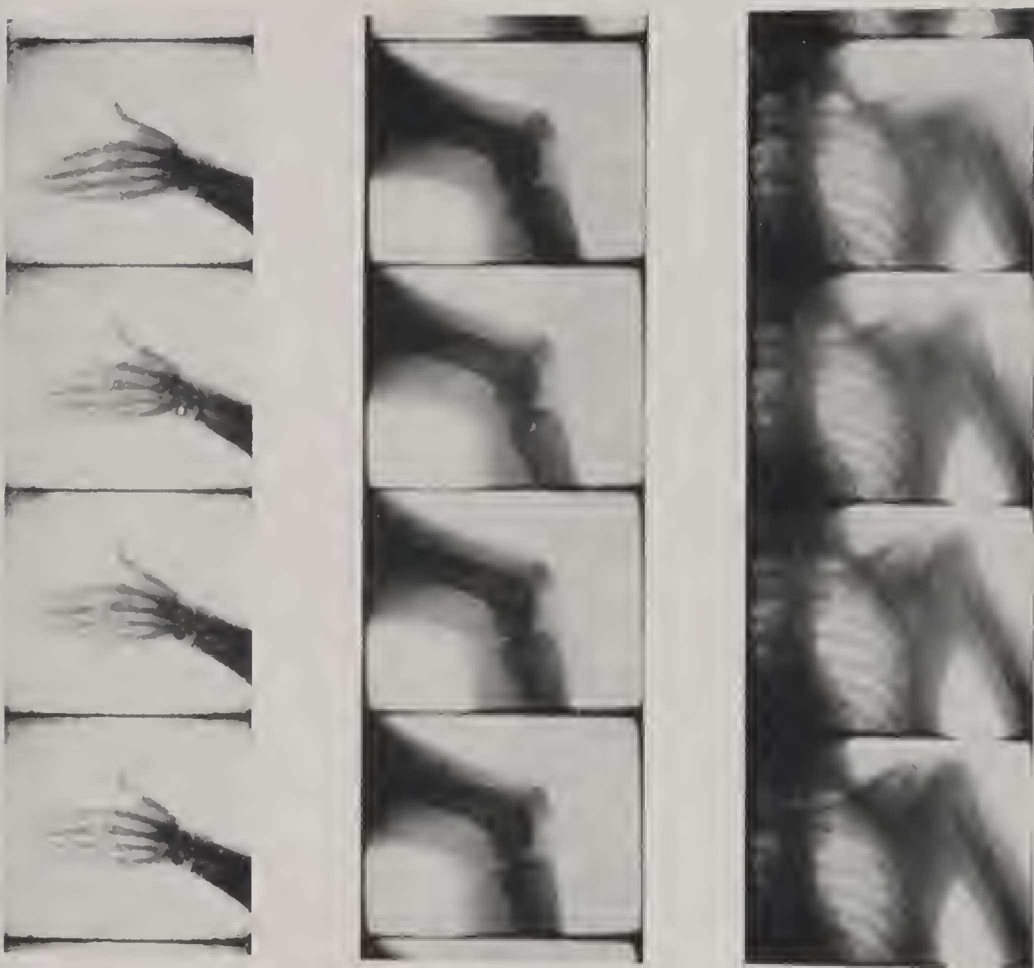
The work of Fairthorne and Salt deserves first place. These films are all obtainable from R. A. Fairthorne, Kirk Michael, Hillfield Road, Farnborough, Hants., or from the British Film Institute. *The Theorem of Pythagoras* (16 mm. silent, 4 minutes) and *Euclid I·32* (16 mm. silent, 4 minutes), 1935, are both films of animated diagrams which adhere closely to the normal text-book proofs of these theorems, attempting to elucidate the steps of the argument by the use of movement. The link with Euclid in his original form is now so slender that it is doubtful whether many present-day teachers will recognise the angle-sum property of the triangle by this numerical reference.

Teachers who have used these films find that they contribute little to their teaching. It is interesting to compare the film on the theorem of Pythagoras with a recent film strip on the same subject (Common Ground Ltd.). This places the theorem in its historical setting, showing alternative lines of proof and applications. Another strip, *Pythagoras and his Theorem* (Marion Ray), shorter, but in colour, deals mainly with Euclid's proof.

The Equation $\ddot{x}+x=0$ (35 mm. silent and 16 mm. silent, 3 minutes), 1936, and *The Equation* $\dot{x}+x=A \sin nt$ (35 mm. silent and 16 mm. silent, 8 minutes), 1937, both represent an attempt to bring differential equations to life by means of an ingenious notation for which great credit is due to Mr. Fairthorne. It is based on the principle of the wheel and disc planimeter. A disc of radius $\ddot{x}$ feeds out a rigid string, whose length is $\dot{x}$. This regulates the radius of a second disc which in turn feeds out a second rigid string whose length is x. This string is now linked up to the first disc, giving the required relation. A sufficient number of cases of this system, for varying radius, were put together to give the impression of continuous motion. The discs become larger or smaller, positive (white) or negative (black), satisfying the equation all the while (see pp. 47 and 51).

The opening sequence shows the symmetry of the relationship and the periodic roots. In the next sequence the loci of

PLATE XVII

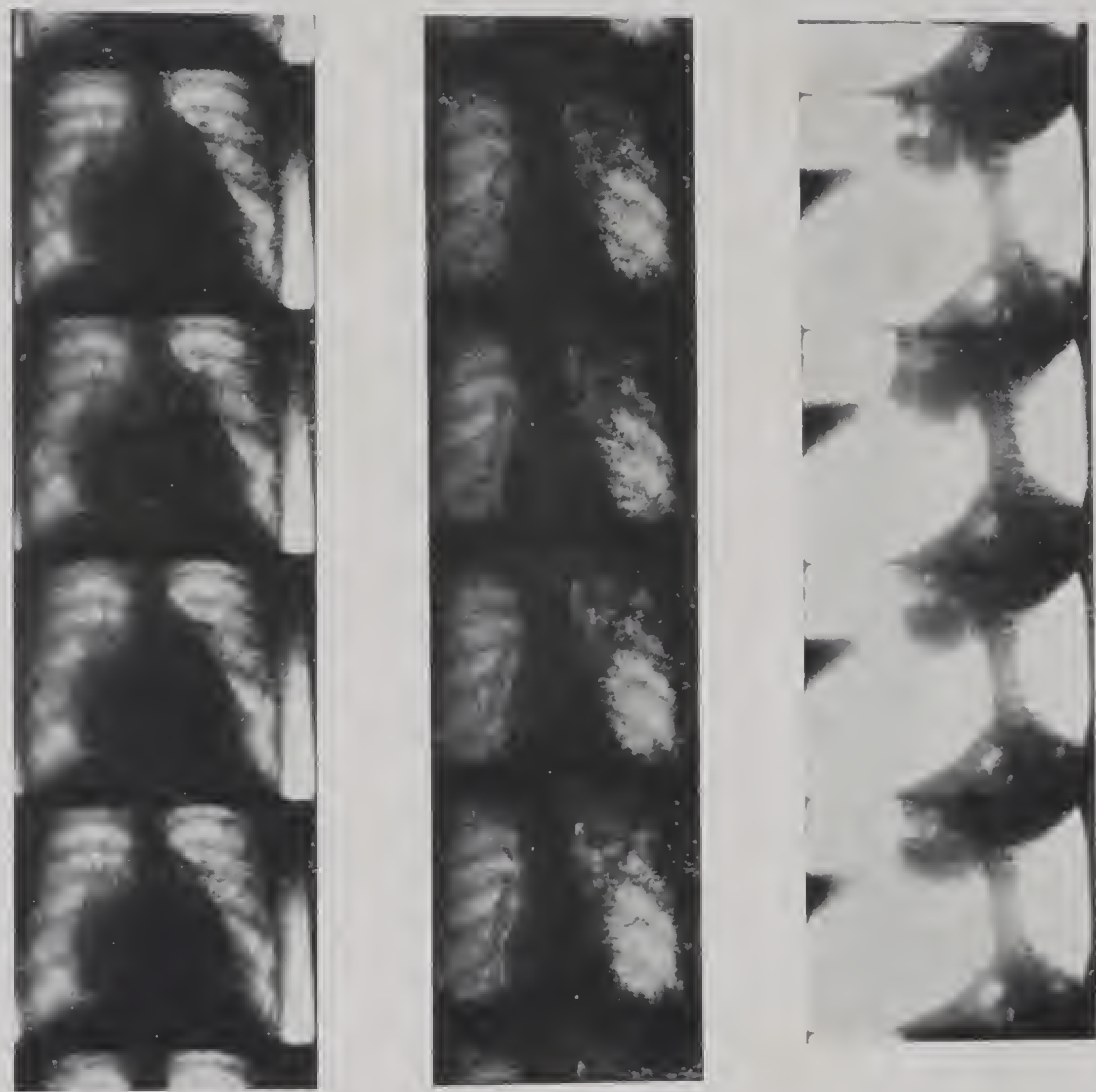


(*a*) (*b*) (*c*)

CINERADIOGRAPHIC STUDIES: (*a*) Normal wrist-joint and hand; (*b*) normal knee-joint, adult male; and (*c*) normal adult, shoulder. All at 25 frames per second, 1/50 sec. exposure.

(see p. 65)

Plate XVIII

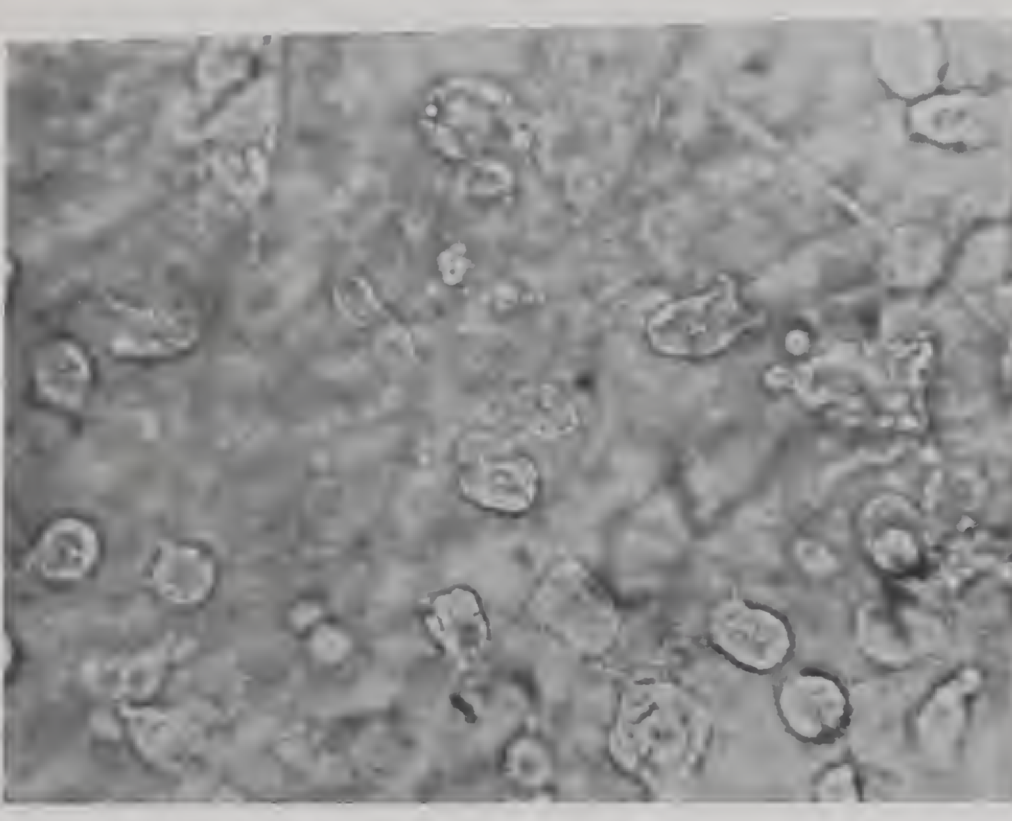


(a) (b) (c)

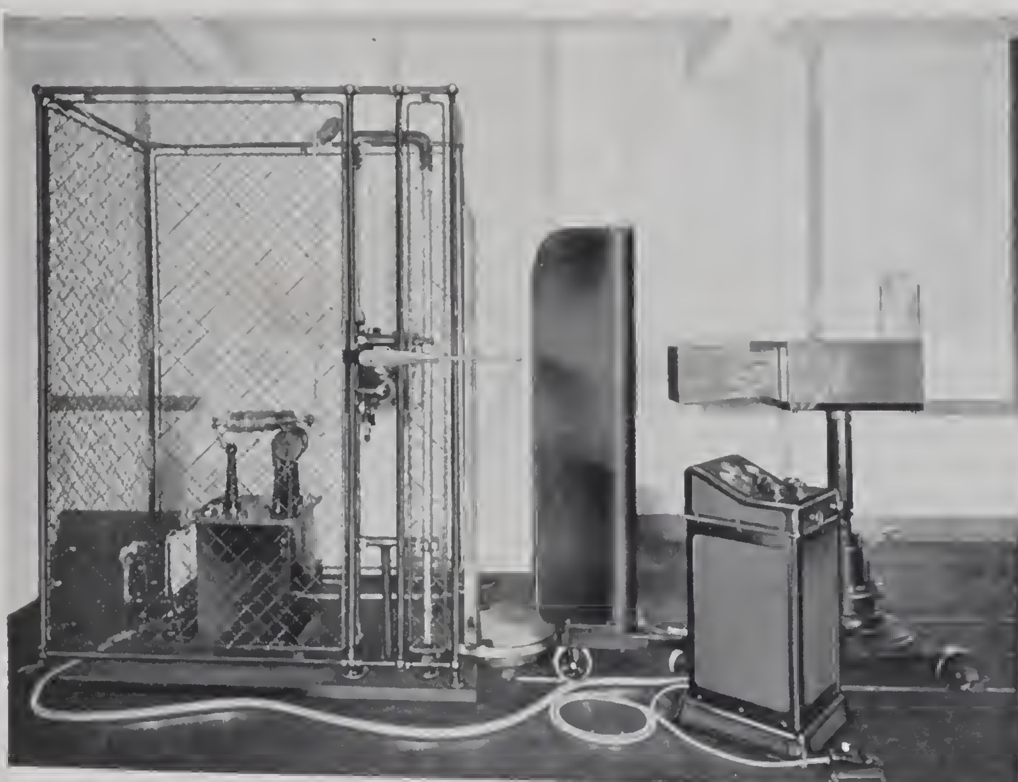
CINERADIOGRAPHIC STUDIES: (a) Thorax, pericarditis with effusion and adhesions: rheumatic heart disease; (b) pulmonary tuberculosis, left apical cavitation; and (c) normal barium swallow. All at 25 frames per second, 1/50 sec. exposure.

It will be noted that all the subjects are taken at the same speed. Density is controlled by varying the milliamperage.

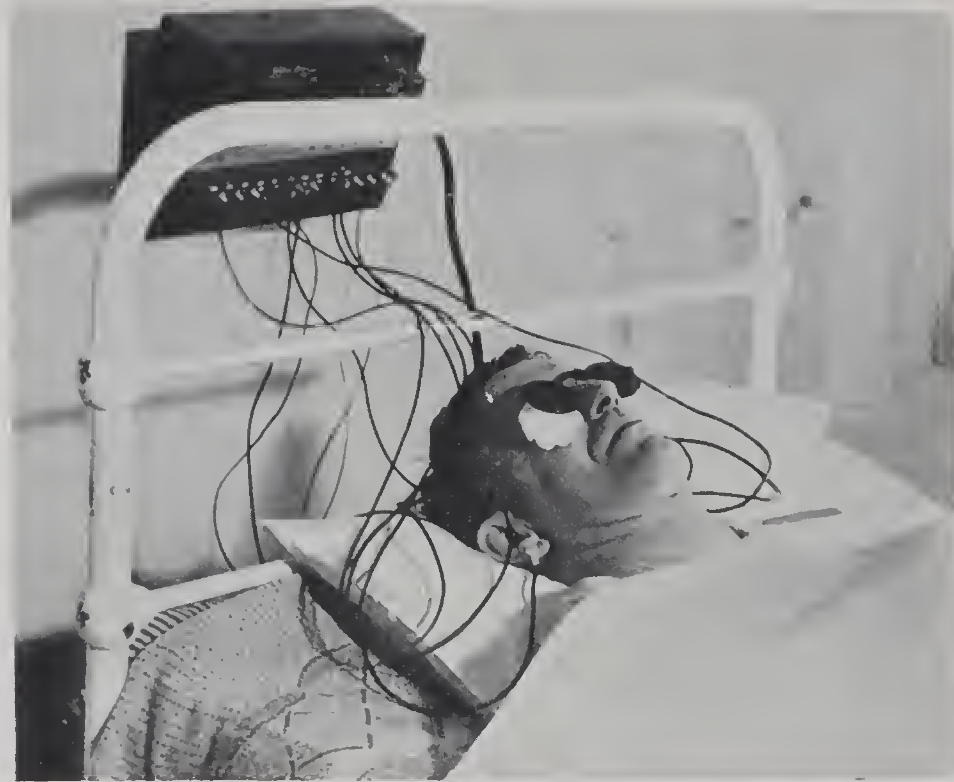
(see p. 65)



LYMPHOCYTES IN MOVEMENT: Part of a lecture film made by the *Sir William Dunn School of Pathology, Oxford.*

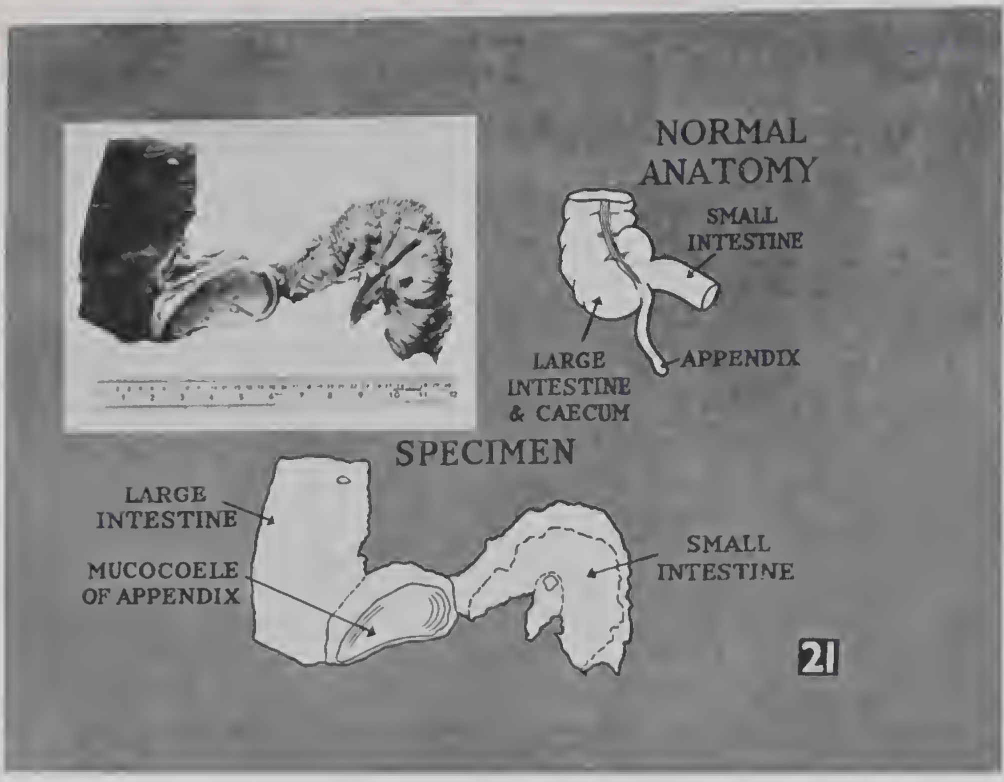


CINERADIOGRAPHIC APPARATUS: Side view of complete unit (See p 63)
(Courtesy of British Medical Bulletin.)



WHAT'S ON YOUR MIND? Recording of electrical impulses in the human brain by means of the electro-encephalogram.
(*National Film Board of Canada.*)

ANAESTHESIA: The eyes of the patient as seen by the anaesthetist, in examining for signs of depth of anaesthesia. The metal object is an artificial airway.
(*Realist Films.*)



FILM STRIP IN MEDICINE: A frame from the Unicorn Head Strip.
(*Voice and Vision Ltd.*)

LET'S LOOK AT WATER: Purification of a city's water supply. Scene shows equipment for adding aluminium sulphate for flocculation of water, prior to rapid filtration.
(*National Film Board of Canada.*)

CHEST SURGERY: Mass radiography at a factory; radiologist examining projected negatives.
(*Central Office of Information*, for *British Council*.)

CHEST SURGERY: A convalescent hospital.
(*Central Office of Information*, for *British Council*.)

Plate XXIII

ACCIDENT SERVICE: Coal-miner with fractured spine, under treatment in the hospital.
(*Central Office of Information*, for *British Council*.)

Plate XXIV

ACCIDENT SERVICE: Six months after accident coal-miner returns to work.
(Central Office of Information, for British Council.)

the ends of the rotating radii are superimposed, to bring out the quarter difference in phase between velocity and displacement and the sine and cosine in the roots. The final sequence shows the harmonic curves obtained by plotting velocity and displacement against time.

In the second film this notation is extended to forced vibrations by bringing the lines which represent acceleration and displacement to bear against the arms of a balance, the pivot of which is given a harmonic displacement of *A sin nt*.

These films are a valuable contribution to the study of differential equations, stimulating, but not simplifying. They must be seen several times before they can be fully appreciated; the first viewing often leaves the audience baffled, for there is much to linger over. In no sense are they an introduction to the subject. To an audience which is fully conversant with the formal mathematics of the topic, aided by a carefully prepared commentary, they can bring a new insight into the subject matter. In *A Hypocyclic Motion* (35 mm. silent, 9 minutes), 1938, a rigid bar slides between two fixed straight lines. The instantaneous centre traces out a circle in the fixed plane and a second circle, of half the radius of the first, on the plane carried by the moving bar. The rolling of the second circle inside the first is shown to be the equivalent to the original motion. Points on the circumference of the rolling circle trace out diameters of the fixed circle. Next, a point on the moving plane describes an ellipse; this sequence is used to illustrate the elliptic trammels, the elliptic chuck and Oldham's coupling. Finally, the envelope of the diameter of the rolling circle is shown to be the fourcusped hypocycloid.

For the mathematician this film is crowded with incident. Many important points are demonstrated in a new and interesting light; but here again, both audience and commentator should be fully prepared or much of the value of the film will be lost. In *The Generation of Involute Gear Teeth* (35 mm. silent and 16 mm. silent, 4 minutes), 1939, two pulleys are connected by a crossbelt on which dots are marked at equal intervals. These dots trace out the involutes of the circles. Tangents drawn to the teeth at the points of contact show the zigzag cutter edge.

This is a valuable step in linking up the mathematics of the involute with a practical application. The film should help both the mathematician in search of motive and the practical man who seeks to know why as well as how. It is easier to follow than the earlier film and should have a wider appeal.

Mention should also be made of Mr. Fairthorne's more recent work on film strip, *Laws of Growth*; *Building Linear and Polynomial Laws Part* 1; *The Exponential Law and its Applications Part* 2, (Common Ground Ltd.), 1947. Both contain much stimulating material, of interest to the student of mathematics, to whom they will suggest further lines of study.

Another type of animated diagram is to be found in the work of Dance-Kaufmann Ltd., specialists in the cycle-film. Each film focuses the attention of the student on a single small topic which needs close study. It is made either as a loop, so that the process may be repeated as often as required, or in a 50 ft. length, in both cases on 16 mm. silent stock.

The Dance-Kaufmann cycle-films deal mainly with physics, but several are of interest to the mathematician. *Harmonic Motions* (a) *Resultant Ellipses* and (b) *Resultant Circle and Straight Line* illustrate the composition of simple harmonic motions. Points move round the circumferences of two circles at constant speed. Lines are projected from the moving points, the point of intersection of the projected lines tracing out the resultant figure. This visual interpretation of the theoretical work is of undoubted value to the student. Other cycle-films from the borderlands of mathematics are *Hypocycloid Gear* and *Intermittent Movement*, which treat driving gear in a similar manner.

The study of wave motion has produced another interesting film, *Mouvements Vibratoires* (35 mm. and 16 mm. silent, 12 minutes), made in France by Atlantic Films in 1933 and obtainable from the British Film Institute. Beginning with the motion of a pendulum, from which it derives the sine curve, it then combines the motion of two pendulums and shows the result of combining two sine curves. An interesting sequence relates this to the motion of a vibrating string. The film is aesthetically pleasing and of some value. The captions are in French, but should present no difficulty.

Rate of Change (16 mm., silent, 9 minutes), made in 1937 by Smith and Segaller, is an attempt to clear up the initial

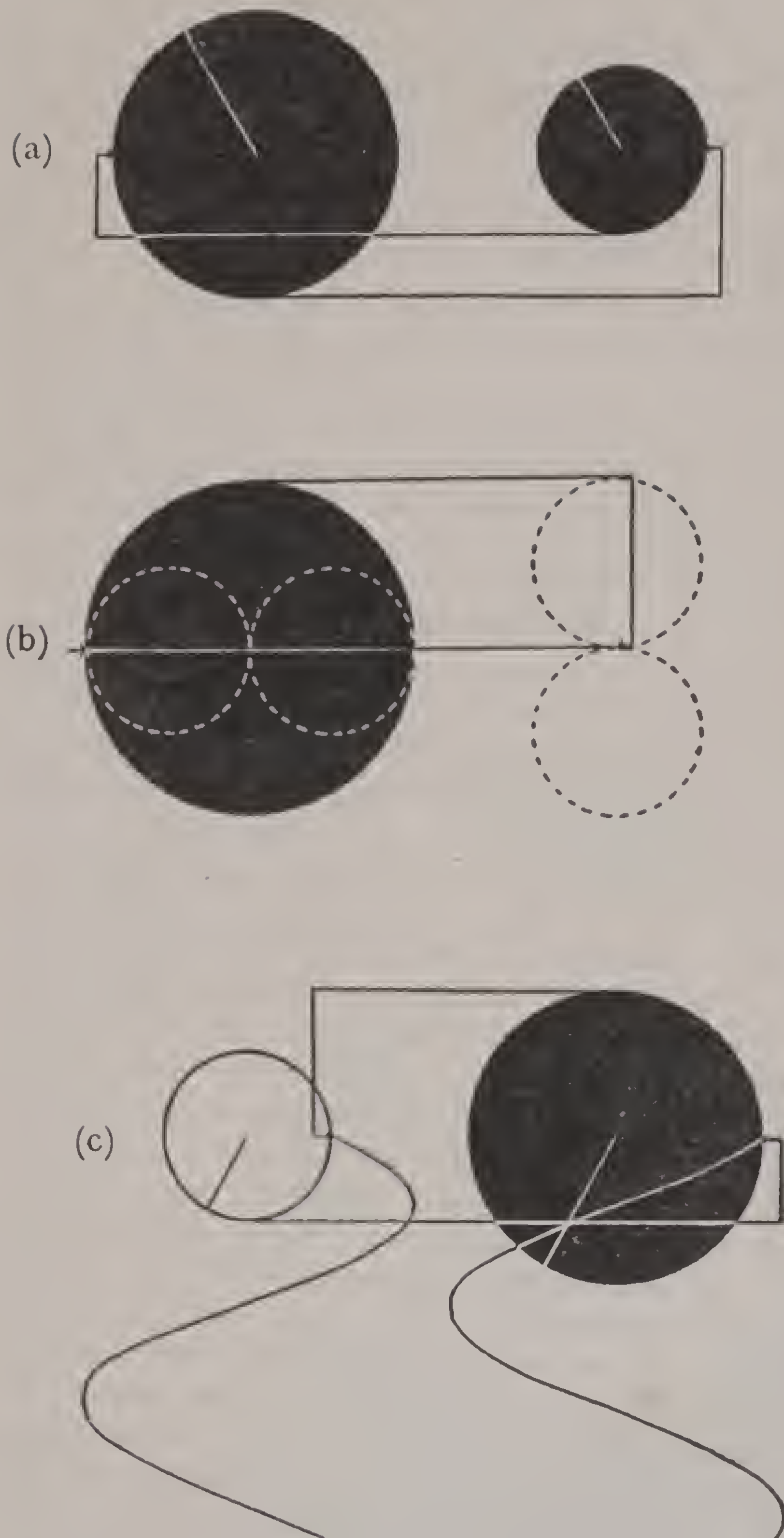


FIG. 4.—Another set of positions in the film $x+\ddot{x}=o$, showing changes of sign (Fairthorne and Salt). See pp. 47–48.

difficulties of the differential calculus; it may be obtained from Educational and General Services Ltd. The approach is conventional, taking the ratio of an increase in y to an increase in x to the limit to explain the differential co-efficient. The only novelty is the car which traces out its own time-distance graph. Otherwise there is nothing here which is outside the scope of the text-book, but nevertheless it forms a useful introduction to the subject, although the argument is not always accurate, some difficulties being glossed over.

Frequency Curves (16 mm. silent, 8 minutes), by the Teaching Film Division of Eastman Kodak Co. (1929), is available from the library of Wallace Heaton Ltd. Research into the size of grain in photographic emulsion is used as an introduction to the problem of classification according to size, which leads to the frequency curve. This part of the film is very fully developed and is a useful aid to teaching; but it has the effect of unbalancing the first part as against the rest. The rapid treatment of the normal frequency curve which follows contains unproved formulae and unexplained statements which are too difficult to absorb.

Einstein's Theory of Relativity (16 mm. silent, 30 minutes), by Fedman and Fleisher (U.S.A., 1924), also in the library of Wallace Heaton Ltd., is a popular introduction to the subject, made at a time when it first attracted the interest of the layman. Relativity is not, unfortunately, a topic which lends itself to this type of treatment and the contents of the film bear little relation to its title. It deals quite effectively with the much more elementary subject of relative motion.

Two films which have found their way into the mathematical lists on slender grounds are *Transfer of Power* (35 mm. sound and 16 mm. sound, 22 minutes) and *Force of Gravity* (16 mm. silent, 15 minutes). The former, made by the Shell Film Unit in 1938 and available through the Petroleum Film Bureau, gives an interesting account of the history of the toothed wheel, in the course of which it gives a short diagram definition of the involute of a circle and another of the epicycloid, both curves being used in shaping gear teeth. *Force of Gravity*, made by Benoit and Levy in France in 1935, obtainable from Educational and General Services Ltd., is no more than a motion picture of an experiment for the determination of

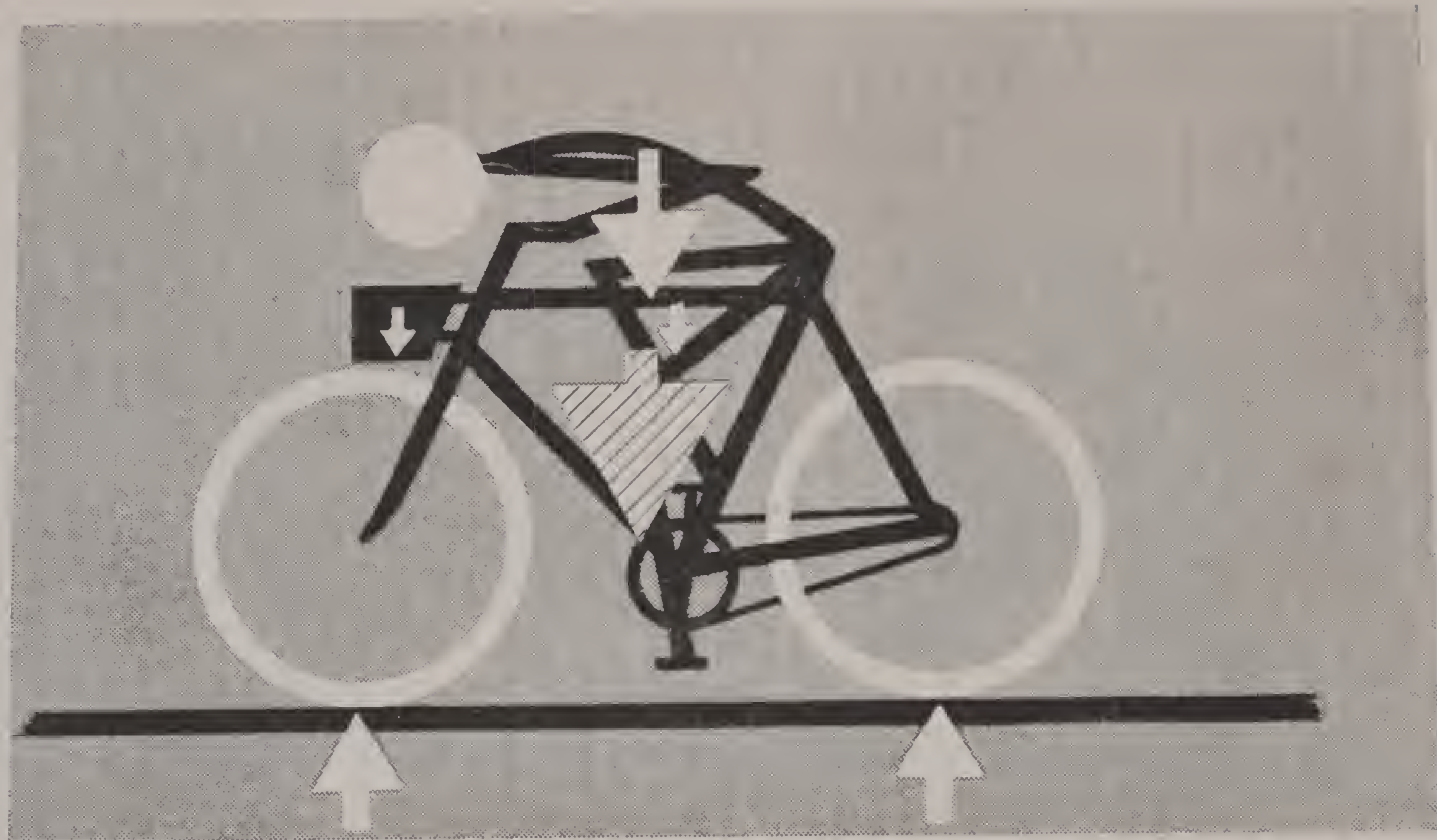


FIG. 5.—A shot from the film strip *The Bicycle* (Educational Publicity Ltd.) showing symbolically the forces of a rider with body well forward. See p. 55.

g. It is difficult to see how this can ever replace the experiment itself. The only mathematics which it contains, apart from the title, lies in three sets of readings, the calculations from which are left to the audience.

Mathematicians who are interested in exhibitions and who cannot get to Paris to see the *Palais de la Découverte* will derive pleasure from the 16 mm. silent film of 30 minutes or more made by its Director. It takes the audience on a conducted tour of the exhibition, silently, but missing nothing. Another purely descriptive film is the magazine, *This is Britain, No.* 17, made by the Merlin Films Ltd. in 1947 and available from the Central Film Library (35 mm. and 16 mm. sound). About a third of this 10-minute film is devoted to a demonstration of visual aids in the teaching of mathematics, which include the use of working models as an introduction to algebra for technical students and visual apparatus for teaching the beginnings of number (see Pl. 25).

From France come two new films on the *Polygon* and the *Parabola*, the work of M. Cantagrel on 16 mm. silent stock. Enquiries for these films should be made through the Central Office of Information to the Paris Institut de Cinématographic Scientifique, but it is not known whether they are available outside France. The films deal very thoroughly with the construction of these figures and give pleasure to the eye. Of the same type are two Czech films on the *Parabola* and the *Ellipse*, both 16 mm. silent, lent for a time to the British Ministry of Education, but since returned. The curves are plotted from a number of points and some of their properties illustrated. All four films are of interest in suggesting new scope for films, but their range is somewhat limited and the sequence sometimes confusing to an English audience.

An example of American mathematical films, *The Slide Rule, Multiplication and Division* (24 minutes) and *Percentages, Proportion, Squares and Square Roots* (21 minutes), both parts 16 mm. sound, produced by the U.S. Office of Education, is available in Great Britain through the Scientific Film Association, to whom it had been lent by the kindness of the United States Embassy. As the title suggests, its purpose is instructional. It deals competently with the method of using the slide rule for these calculations, but it is doubtful whether, except for mass

education, the film has any advantage over the usual 7 ft. model to be found in any technical college. In Switzerland, J. L. Nicolet, a teacher of mathematics, has produced a new type of cartoon film. This aims, not so much at the elucidation of a mathematical topic, as at the development of mathematical intuition. A series of animated diagrams are shown in such a way as to lead the audience to discover the mathematical result, which is then formally proved. Copies of the film are not yet available in Britain, but two pamphlets on "Le Dessin Animé", published in Lausanne, give a full account of the method.

An account of recent progress in the field of mathematical films would not be complete without reference to new work in film strip, designed to overcome the difficulties of the beginner by bridging the gap between his concrete surroundings and the abstractions of mathematics. *Introduction to Geometry* (British Instructional Films Ltd.) is a very short, single lesson, as an introduction to the solid. *The Football Field* and *The Bicycle* (Educational Publicity Ltd., Fig. 5) provide paths into the realms of mathematics beginning amongst the daily activities and interests of the pupil and ending where fancy leads. Further strips in this series, on such topics as *Chess*, *Building a House*, *Preparing a Meal*, and *Making a Dress*, suggest new possibilities in the teaching of elementary mathematics.

Additional information on films from other countries is given below.

Germany. *Institut für Film u. Bild.*

Research and Teaching Films for Universities and Technical Colleges, made before 1939.

Darstellung der Kurve mit der Gleichung $r = a. \frac{\sin 4}{\sin 3}$ (A. Greiner, Berlin)

Der Drehkegel (R. Baldus, München).

Das einschalige Drehhyperboloid (R. Baldus, München).

Gegenüberstellung von Drehkegel und einschaligem Drehhyperboloid (R. Baldus, München).

Konforme Abbildung $w = \frac{1}{z}$ (H. Heinrich, Breslau).

Konforme Abbildung $w = z + \frac{1}{z}$ (H. Heinrich, Breslau).

Further information obtainable from Dr. G. Wolf, Institut für Film und Bild, Höckelheim, b. Northeim, Hannover.

Sweden. *A.B. Master-Film, Björnelunda.*
From Abacism to Modern Computing.
Circular and Hyperbolic Functions.
Elliptic Functions.
Differential Equations of the First Order.
Further information obtainable from Professor Alfred Liljeström, Professor of Applied Mathematics, and Director, Department of Visual Instruction, Royal Institute of Technology, (Kungl. Tecniska Högskloan), Stockholm, 26.

TECHNIQUES

CINÉRADIOGRAPHY

Its Technique and Applications

RUSSELL J. REYNOLDS, C.B.E., M.B., B.Sm., F.R.C.P., M.R.C.S., F.F.R., D.M.R.E., M.I.E.E., F.A.C.R.

Consulting Physician, Radiological Department Charing Cross Hospital; Hon. Advisor in Radiology to the Ministry of Pensions, and Ministry of Supply; Hunterian Professor, Royal College of Surgeons, 1936–7.

THE FIRST "X-ray photograph" (as they were then called) of human subjects appeared in 1896, and the writer still possesses an X-ray plate taken by himself in September of that year. The apparatus he used at that time is now in the Science Museum, South Kensington. It is interesting to note that as early as 1897—only two years after the discovery of X-rays by Professor W. K. Röntgen of Wurtsburg, in November 1895—Dr. John MacIntyre of Glasgow attempted to produce an X-ray cinematograph film.

The principle of cinematography was first established in 1896, and was thus only in its infancy at the time of the discovery of X-rays. MacIntyre's choice of method was limited by the means at his disposal. He took serial photographs of a frog's leg, moving its position slightly between exposures. The complete series of plates was then re-photographed on to a cinematograph film for projection. The method he employed might be described as Synthetic and was clearly only of experimental value, and quite inapplicable to the examination of the ordinary human subject. The level of tolerance of living tissues to X-rays was reached and passed long before a sufficient number of radiographs could be taken.

It was many years after this before the subject again received attention. Gradually, apparatus became more powerful and the X-ray tubes more reliable, and the fluorescent screens used to convert the invisible rays into visible light, were improved to give greater luminosity. Sensitivity of the photographic film emulsion was increased, and lenses of wider

aperture were designed. It then became theoretically possible to make cinéradiographic films by completely different methods.

METHODS OF PRODUCTION OF CINÉRADIOGRAPHIC FILMS

At the present time there are only three ways in which an X-ray cinematographic film can be obtained, namely: (i) the Synthetic Method, (ii) the Direct Method, in which a series of skiagrams is taken at short intervals upon a long strip of film, and (iii) the Indirect Method, in which a photograph is taken of the image appearing on the fluorescent screen.

(1) *The Synthetic Method.*

We have already dealt with this above; a modification of this method was more recently developed by Van de Maele and some other workers and has been used where speed is not essential. A series of isolated films is rapidly taken, the movement being carried on the whole time. This modification can hardly be compared to MacIntyre's original process where the object to be radiographed was held still as long as it was required, then, after one exposure, was moved to a fresh position ready for the next. The series of films was re-photographed on to a standardised film for projection. The original synthetic method was, moreover, quite inadequate for obtaining representations of involuntary movements, such as those of the alimentary canal, which could not be kept stationary while the exposure was made.

(2) *The Direct Method.*

This method utilises the power which X-rays share with light, of affecting a sensitised photographic emulsion. X-rays emitted by the tube pass through the subject under examination, then strike the sensitised film which is momentarily clamped between two fluorescent or intensifying screens. The screens re-enforce the direct action of the rays by the visible light which they emit when the rays impinge upon them. Such screens are employed in normal radiography.

The essential features of apparatus for this technique are that there should be some method of passing a large area of film into position, holding it absolutely still while the exposure

is made, passing it on and repeating the process as long as necessary and then subjecting it to the various processes for the developing of the image. These requirements are difficult to fulfil, and present many serious mechanical problems. In order, as far as possible, to make it practical, a restricted field of 4 in. × 5 in. is usually employed, but this sets a limit to its use, as each separate frame of the series must be at least as great in area as the projected dimensions of the part under examination. For example, should the operator wish to make a film of the chest, he would be faced with the problem of running a film area of 180 sq. in. into position between two fluorescent screens many times a second (at least 14) and holding it there absolutely still while the exposure was made. This allows at the most 1/28th second for the necessary movement. With a total exposure time of 10 seconds, a strip of film would be 140 ft. long by 15 in. wide. The difficulties of designing an apparatus capable of handling such a film are very great, and the cost almost prohibitive. Further, the problem of processing still remains, followed later by reduction to a standard size for projection.

This obviously precludes large areas being filmed, but allows records to be obtained of some of the organs, and rather circumscribed views of most of the joints. It is, however, a method essentially only for research institutions and laboratories and cannot with advantage be used in hospitals or private practices. Even with an exposure field reduced to 5 in. × 4 in., film costs are high and the problem of keeping the film free from vibration during exposure presents really serious difficulties.

(3) *The Indirect Method.*

In this method a rather different principle is employed. The rays, passing through the patient, strike a fluorescent screen, and the shadows cast on this screen are photographed in the ordinary way with a cinematograph camera. These shadows formed by visible light can be focused by photographic lenses, and in consequence much larger areas can be examined; the resulting cinéradiographic film need not be reduced in size, and can be used either as a negative or reproduced by contact as a positive. In the latest work by

this method, short lengths of positive film are made, containing a few cycles of movement, and these are joined into bands for continuance projection. They can then be projected and studied at leisure.

The choice of employing 16 mm. or 35 mm. film is entirely dependent upon the lens available. So far 16 mm. film has been used as, with this, all the subsequent treatment is so much simplified, and the apparatus employed is naturally simpler to handle.

It would seem that the method of choice from every point of view is the Indirect Method. It was the one chosen by the writer in 1921, when he started his investigations, and this method has been used since, in those countries where interest has been aroused in this subject.

It would be as well to mention the problems that arise in designing apparatus for the production of these films. It must be remembered that the intensity of light emitted by the fluorescent screen is not great, and depends on the following factors: (1) the quality of the screen, and (2) the intensity of the beam of X-rays that activates the screen.

At the present time, there is a limit to the quality of the screen that is available. The intensity of radiation, however, depends on the X-ray tube employed, and the apparatus used to produce the current for its excitation.

As a maximum intensity of illumination of the fluorescent screen is necessary to obtain rapid exposures, it is not possible to make use of lead glass to protect the camera unit from X-rays; because a very considerable proportion of visible light would be absorbed by the glass. A large percentage of X-rays passes straight through and the camera and film have to be protected against this direct beam of rays by enclosure in a lead-lined case.

The safety of the patient is the primary consideration. From the foregoing, it is clear that the fluorescent screen will only emit a satisfactory quantity of light if the X-ray beam is of high intensity. Under these circumstances, the risk to the subject of over-exposure to radiation would normally be considerable, and the strain on the X-ray tube would be correspondingly great. These risks are eliminated in the writer's apparatus, by incorporating a switch which synchronises the

excitation of the tube with the opening of the camera shutter. In this way, the exposure of the subject to radiation is reduced by 50 per cent and the strain on the tube to an equal extent.

At the present time it is possible to obtain films of the joint movements at speeds up to 50 frames per second (1/100th second exposure) and of the heart at 25 frames per second (1/50th second exposure). These films are capable of producing a slow-motion effect when projected.

With recent improvements in emulsion, making the film more sensitive, exposures have been reduced, and any possible risk to the subject under examination has been steadily diminished.

An exposure time of 10 seconds is usually ample for the examination of any moving organ and the subject only receives 64 r units of radiation for each single exposure; at the present time this method is simple, reliable and safe. As the resulting negative is printed on to a positive strip, any length of positive can be made for projection purposes. It is often convenient, however, to print a short length of positive film which can be joined into a band and passed through the projector continuously, and studied at leisure.

With the apparatus now in use, over 2,000 cinéradiographic films have been made—at least 90 per cent of human subjects—and at no time has there been any evidence of over-exposure to radiation, although many of the subjects have been repeatedly examined (see Pl. 19).

From the foregoing it will be clear that cinéradiography not only opens up a vast field in research, but will give invaluable aid in medical diagnosis. It is not yet possible to set a limit to its uses and applications, and although a great deal of experimental work has been carried out, considerable time will elapse before its potentialities are assessed. Its value in the examination of the normal movements of joints is obvious, just as is the detection of possible causes of restricted movement, and later, comparison of the degree of movement before and after treatment.

It is probable that in the future, a cinéradiographic record of the heart-beat will be included as a routine procedure, in the complete medical examinations of that organ. But before advantage of this technique can be fully utilised in the diagnosis

of abnormal conditions, further study of normal cinéradiographic appearances is necessary.

Just as it is necessary to possess adequate knowledge of the normal appearance of an organ under examination in a "still" radiograph, before proceeding to the diagnosis of the abnormal, so it will be necessary to be equally familiar with the appearance in normal and abnormal movement in a cinéradiographic film. The response of organs to the action of drugs, offers another interesting field of study, and it may be advisable to make films of the heart, recording simultaneously the electrocardiograph tracing at the base of the film. This has been already successfully carried out by the writer, both with the cathode-ray oscilloscope, and the Cambridge string electrocardiograph instruments. Needless to say, sound-recording can always be incorporated.

Further examples of the uses to which cinéradiography can be put in the medical sciences, can be multiplied almost indefinitely. Nothing has so far been mentioned as to its application in medical education. Students assimilate knowledge far more easily if they can see the actual movements at leisure, and permanent records are always available.

In experimental physiology, cinéradiography has already proved its worth, and in experimental science generally, its value has yet to be assessed.

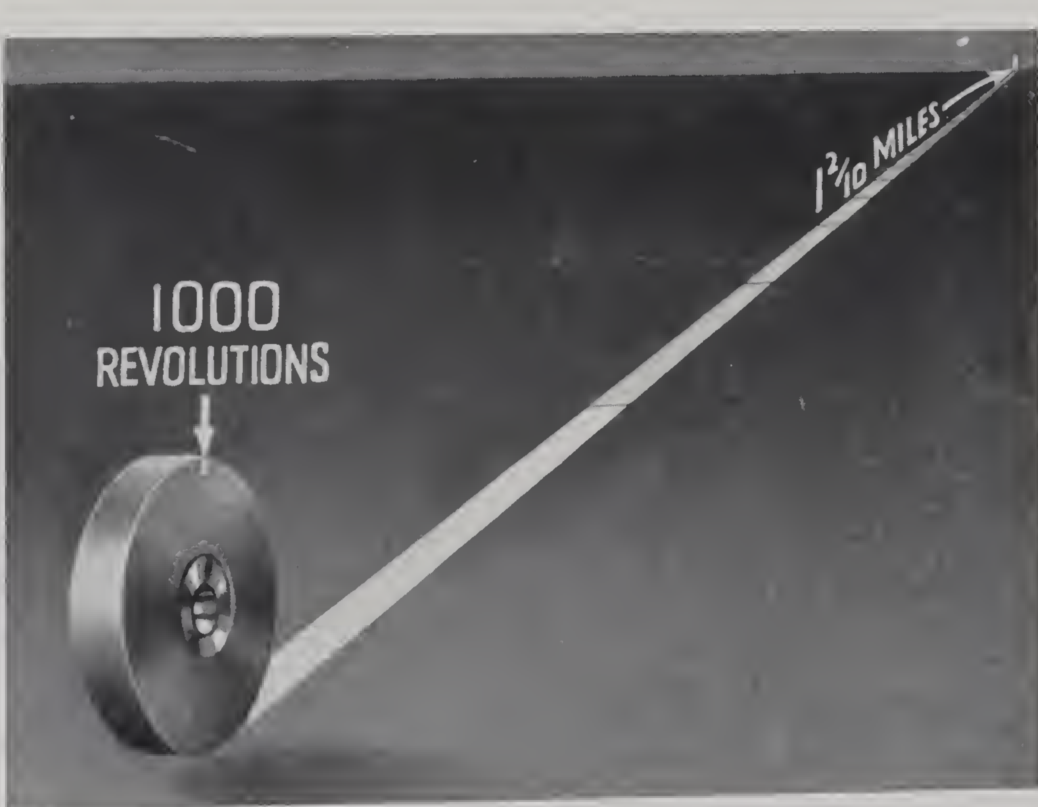
In February 1936, by the generosity of Lord Nuffield, a cinéradiographic apparatus was installed at the Nuffield Institute of Medical Research, Oxford. The department was opened by the late Sir Farquhar Buzzard, Bart., Regius Professor of Medicine at the University of Oxford, and the writer then gave a demonstration of its uses. Subsequently, experimental work with the apparatus was undertaken by Dr. A. E. Barclay, in 1939; and a paper was published in conjunction with the late Sir Joseph Barcroft, F.R.S., Dr. Barron and Dr. K. J. Franklin on radiographic demonstration of the circulation through the heart of a sheep both in the adult and in the foetus, and the identification of the ductus arteriosus.

Apart from general examination of patients for diagnostic purposes, and the recording of normal movements in healthy patients, several important pieces of research work have been carried out. In a Hunterian Lecture at the Royal College of

SEEING IS BELIEVING: A scene from "This is Britain", No. 17; a pupil studies a mathematical model.

(*Central Office of Information*, for the *Board of Trade*.)

A WATER CYCLE.
(*Encyclopædia Britannica Films, Inc., U.S.A.*)

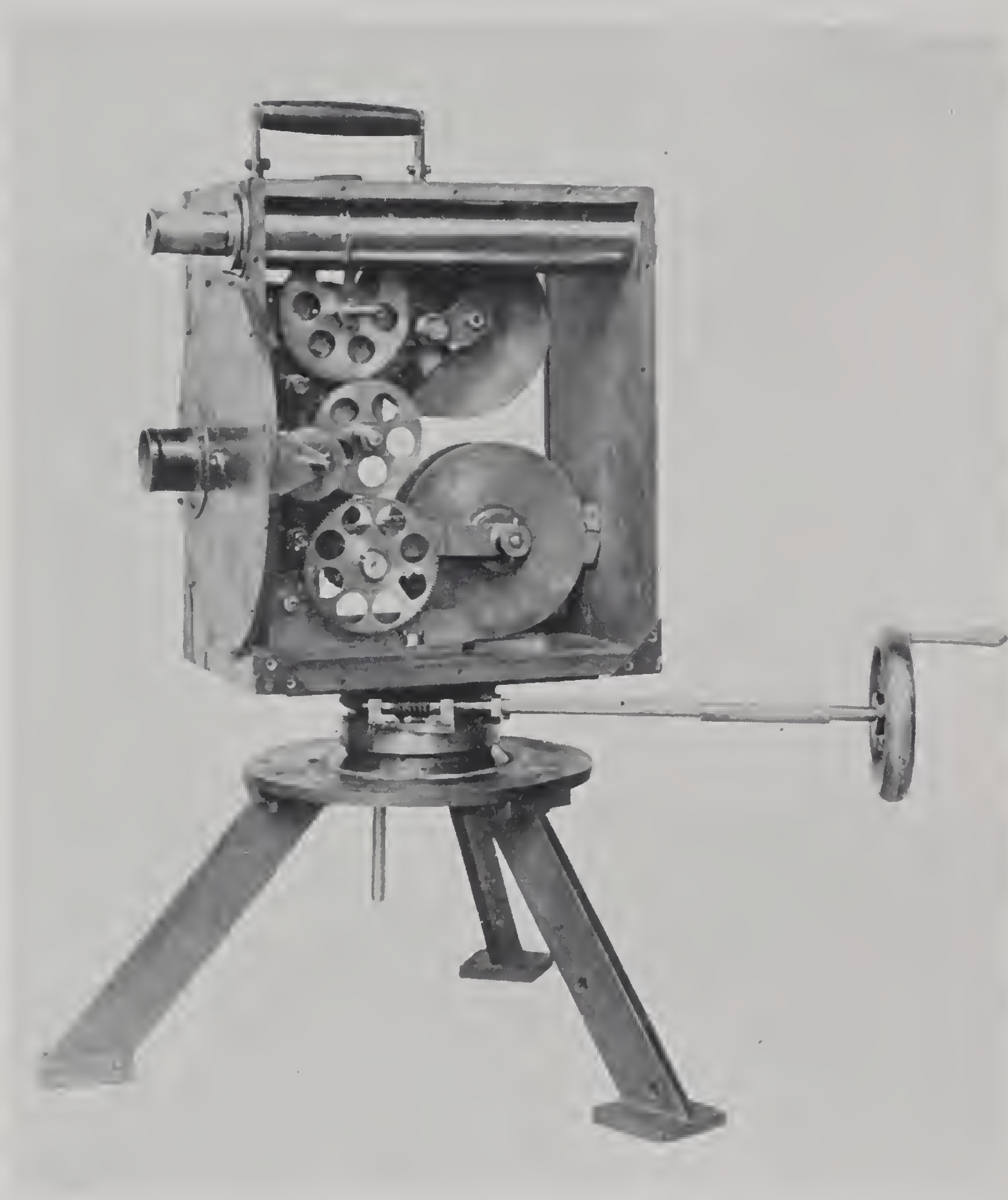


FIRST PRINCIPLES IN GRINDING: Animated sequence showing that any single point on the surface of a 24-inch wheel making 1,000 revolutions per minute will travel more than a mile a minute in surface speed.
(*Carborundum Co., Ltd., Great Britain.*)

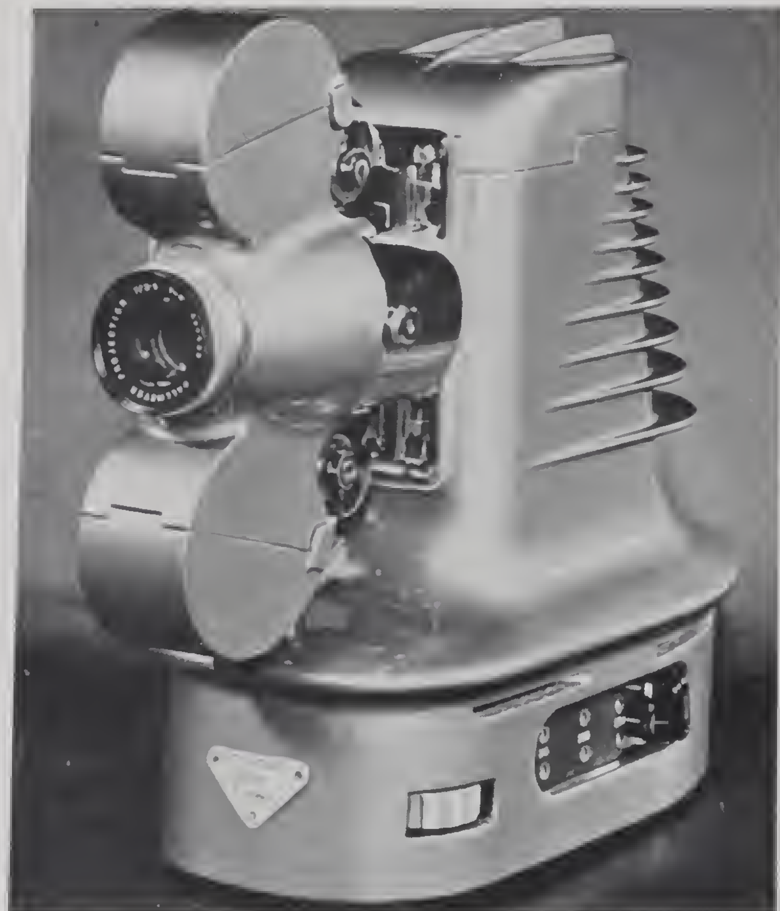
THE MICROSCOPE: Bringing down the high-power objective before focusing on the preparation.
(*Realist Film Ltd., London.*)

THE MICROSCOPE: Using a pencil as an aid in focusing the condenser.
(*Realist Film Ltd., London.*)

Plate XXVIII



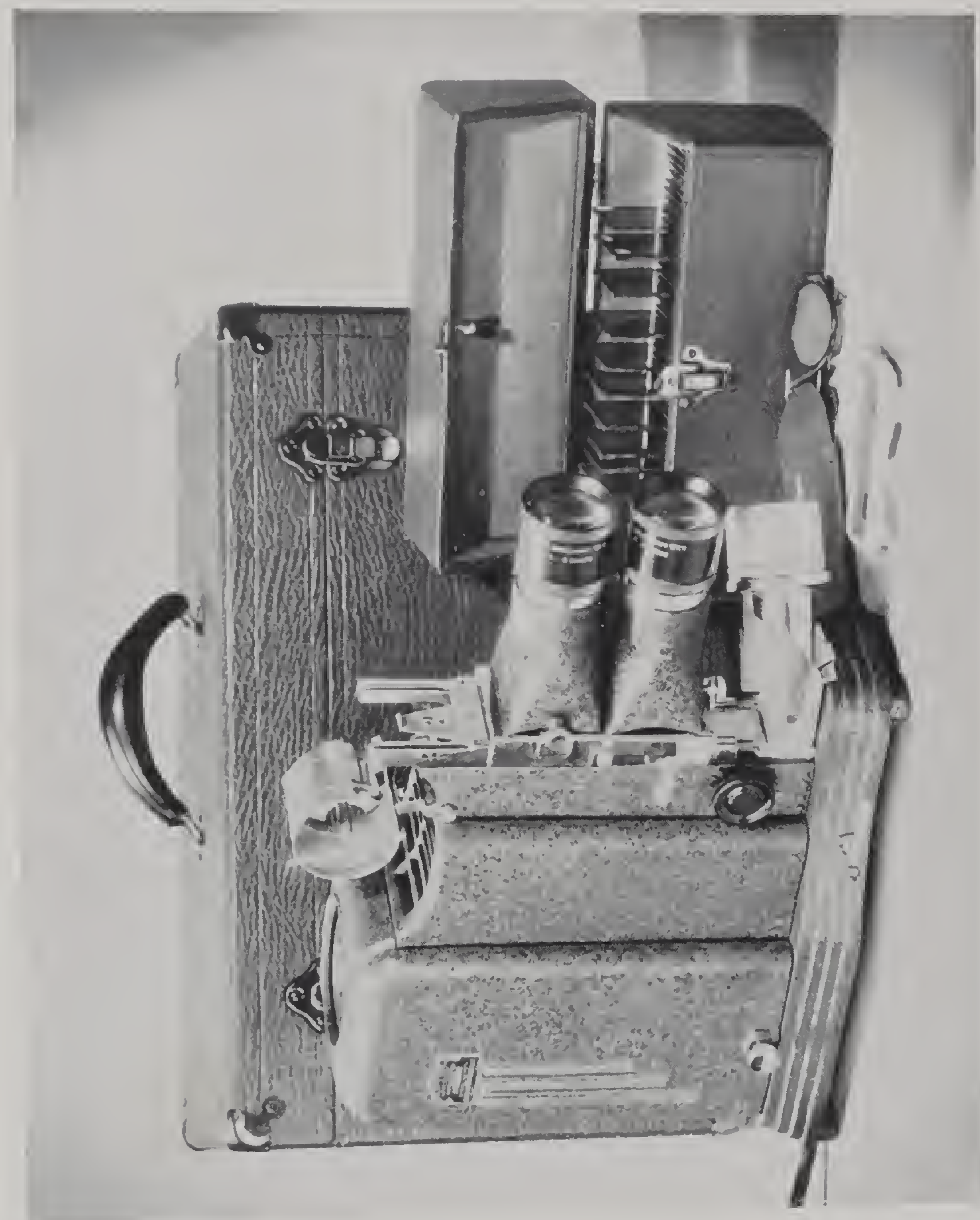
PAUL'S KINEMATOGRAPH CAMERA: From an exhibit in the Science Museum, South Kensington, London.
(*Crown Copyright Reserved.*)



A MODERN FILM-STRIP PROJECTOR.
(*Dufay-Chromex Ltd., England.*)

"WRAY" MICROFILM READER.
(*G. Hana Ltd., England.*)

PLATE XXX



"POLAROID" STEREOSCOPIC STILL PROJECTOR, SPECTACLE VIEWERS, AND CARRYING CASE.

(Society for Visual Education, Inc., U.S.A.)

PLATE XXXI

PROJECTOR, 16MM.: In use in classroom.
(*Ampro Corporation, Inc., U.S.A.*)

Plate XXXII

A modern small projection room.
(Ampro Corporation, Inc., U.S.A.)

Surgeons in January 1937, the writer demonstrated the results of his research on the movements of the oesophagus, stomach and duodenum during the passage of an opaque meal.

In 1939 this method of investigation was used to demonstrate the action of the Bragg-Paul pulsator. The films were shown at a meeting of the Physiological Society of Great Britain ("Cinéradiographic films illustrating normal respiration and artificial respiration with the Bragg-Paul Pulsator").

Normal respiratory movements of a healthy male and female were shown, and the movements were observed when the depth of respiration was increased by the use of the Bragg-Paul pulsator. Movements in the latter case were similar to those observed in deep breathing of the subject, increased diaphragmatic movement being evident as well as increase in the costal excursion. In the films of unassisted quiet breathing, the usual pause at the end of respiration can be seen and measured. This is not evident in the artificial respiration films when, however, a pause occurs between inspiration and expiration.

In conclusion, it may be stated that only by the cinéradiographic method of examination can one adequately study the functions of organs and joints, and obtain complete records of movements. Until recently, movements have been observed only on screen examination, i.e. the fluorescent-screen image; this necessarily has to be very rapidly conducted owing to the danger of over-exposure to X-rays. The radiologist has to be content with viewing the screen for a few seconds only and memorising what he has seen. He can, of course, take a film at any given instant, but this merely records conditions at the particular moments of exposure. With a cinéradiographic film, however, it is possible to obtain a permanent record of movement which can afterwards be studied at leisure, and it is available at all future times for comparison with other cinéradiographic films that may be made. This record can be kept with patients' notes and can be examined with the patient at any future consultations that may be necessary, wherever the patient may be (see Pl. 17 and 18).

The cost of production is small, not exceeding that incurred in having a complete X-ray examination in the usual way.

The writer wishes to acknowledge the very valuable co-operation and help he has received during the last few years from his two sons, Dr. Seymour Reynolds and Dr. Stewart Reynolds, and also from Dr. Hugh Hay.

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TECHNIQUE AND EQUIPMENT: RECENT ADVANCES

DEREK STEWART,
Director, Simpl Ltd, London.

Many of the fundamental problems in ciné-photography are problems in photography, so that advances in the former have contributed materially to development of the latter. But the problems of ciné-projection are shared in part by the still projectionist, and what the latter has learned in development of screens, lighting, and so on, has aided the former. But cinematography has special features particular to itself. The recent war has stimulated technical advances in all three, and it is the purpose of this article to review, necessarily in some brevity, the major developments.

Sensitised Photographic Materials.

In cinematography, as in many other fields, advances in photographic emulsions have not been noticeably great. During the war however, an ultra-speed material was used by the Allied Air Forces who needed it for photographic reconnaissance in dull light, when the long shadows just at dawn and at dusk aided interpretation of the results. For this purpose the Kodak Research Laboratories in the U.S.A. and in Great Britain produced Tri-x, which in some cases was six times as fast as the previous highest available emulsion speed, although the Tri-x was rather grainy, it served that purpose excellently. The Royal Air Force Film Unit produced several remarkable films of night raids, using 35 mm. Tri-x stock, for example, that of a night raid on Genoa. Here, using only the light from the flames of the burning buildings and the candle flares dropped by the bombers, the film showed figures of people in the flaming streets below. A film of such high sensitivity as Tri-x would obviously have many uses in scientific photography; it is available in the U.S.A. but regrettably not in

Britain, where even more essential photographic materials are still in short supply.

The prospect of the availability of such high-speed films and even faster emulsions in the future raises interesting possibilities for low-light photography. Many research problems which could be solved by cinematography where the available light is necessarily low, come readily to mind: examples are the study of fish habits by underwater cinematography, the recording of very fast transients on cathode-ray tubes, and indeed, many problems in ultra high-speed-cinematography where lack of sufficient exposure is a common trouble.

Two other major contributions from the Kodak organisation were a new finer grain positive material for release prints, and new sound-recording films. The fine-grain positive material (known by its code number 1302) gives better screen quality in the cinema than hitherto, with a clearer picture and a lower ground noise on the sound track (7, 9). The new sound-recording film, known as Type 1372, is for variable area sound track only. The increased resolution of 150 lines per mm. as compared with 50 lines per mm. for the old Type 1358 film, allows the range of recorded frequencies to be considerably increased. For variable density track the new film, Type 1373, has a resolving power of 90 lines per mm. This film is specially arranged to cover variations in the processing in the laboratory. It has a very low gamma-infinity, and thus a slight gamma variation occurs over a very long range of development conditions, and this gives much easier quality control.

Colour Materials for Cinematography (1, 4, 5).

Technicolor (35 mm.) uses two films in the one camera, and requires special equipment, which is so expensive as to restrict its use. The Technicolor cameras which are available in Britain are nearly always fully committed to feature productions; this, and the expense, has permitted only few scientific films to be made by this process. Continuous research has improved Technicolor considerably since 1939, particularly in definition, and a Technicolor film of only five or six years ago appears crude when compared with recent material.

As the only practical process available, 16 mm. Kodachrome has been used extensively and successfully for scientific

films. The earlier method required three separate colour developments on three continuous machines, and a drying operation after each machine treatment. But in 1940, Dr. C. E. K. Mees, Director of Research of the Eastman Kodak Co., announced a more rapid and greatly improved method of Kodachrome processing which in general has not been altered. By the new method, the film is processed continuously on a single machine. After development of the film as a negative, it moves forward through the machine to a point where it is exposed to red light through the back of the film, which affects only the back or red sensitive layer of the integral triple emulsion. Next the film passes to a cyan developer and a blue-green dye image is produced in the back layer without affecting the two upper layers. After this stage, the film is exposed from the top, to blue light, which acts only on the top layer and permits the subsequent development of a yellow dye image therein. Finally, the middle layer is developed to form a magenta dye image. The silver that is formed during dye image development is removed subsequently from all three layers, leaving a final image having only three super-imposed dye images.

Sixteen-mm. Kodachrome has very little latitude in exposure, not more than half of one stop, but when correctly and carefully exposed, unequalled results can be obtained. As the use and experience of Kodachrome has increased (6) the quality of the duplicate has improved, although the problem of making more than about fifty copies of high quality from one original has not yet been satisfactorily solved. In normal black and white technique, prints for release are made from a high quality master copy of the film originally shot in the camera. When this master becomes scratched and worn through being continually run through the printer, another equally good master can easily be made. With Kodachrome, the copies are always slightly inferior to the original, and copies made from a master that is itself a duplicate are in general too degraded in colour quality for release to a critical audience. Thus all the prints must be made from the film originally shot in the camera.

Kodachrome 35 mm. is now available in lengths up to 50 feet for the manufacture and duplication of colour film strips, and the processing is in every way similar to the technique for 16 mm. stock.

A reversal colour process (3) on 16 mm. stock was made available on the American market in 1944 by the Ansco Company. The film is faster than 16 mm. Kodachrome and although the original results are quite satisfactory, the quality of the copies is generally considered slightly inferior to the results obtained with other 16 mm. colour processes.

Two other interesting new 35 mm. colour processes developed during the war are the Agfacolor Process (2) developed in Germany, and the British Tricolour Process (3). Neither of these methods is generally available but the results from each can be extremely good. The Agfacolor process is an integral tripack emulsion similar to Kodachrome, but instead of a differentiated processing for each layer, a single colour development operation is employed which produces different colours in the three layers, by means of dye-coupling materials embodied in the respective emulsion layers. One problem with Agfacolor is that the sound track is recorded in the blue dye layer, and this would necessitate the use in cinema projectors of antimony-caesium photo-cells, as the present photo-cells are not sufficiently sensitive to blue light. Stock manufacturers have investigated the Agfacolor process for the professional market, and only the U.S.S.R., with the aid of German technicians, are at present producing any of the materials (8).

The British Tricolour Process has two methods of photographing the subject. In the first, a special bi-pack is used to record two colours and a beam splitter directs the image on to another single layer material in a specially designed camera built for the purpose. In the second method the pictures are recorded on a single negative with consecutive frames exposed through different colour filters and run at 72 pictures per second. The printing method envisaged, consists in: (i) printing the blue record negative upon a positive emulsion containing a yellow "former", (ii) re-coating with an emulsion containing a magenta "former" and exposing through the green record, (iii) and again re-coating with an emulsion containing a cyan "former" which is printed from the red record. All three layers are colour-developed simultaneously.

The results obtainable from colour photography have improved enormously in the last ten years, and in many cases leave little better to be desired; a great deal of further research

is, however, necessary to make the various processes more easy to handle, and the quality of the results more consistent.

Light Sources for Cinematography.

In producing a scientific film, lighting for general photography is not fundamentally different from that required for making any other film: but some shots are so difficult that all the ingenuity of the lamp manufacturer and the physicist is necessary. There are several new light sources of great interest for their possible uses in scientific photography, and hence, in cinematography.

Fluorescent Lighting (14, 15, 10).

Fluorescent lighting has many uses where hard shadows must be avoided, and particularly when photographing models, copying diagrams and making titles. An admirable general-purpose unit can be made by mounting five or more tubes, five feet long or in shorter lengths, side by side in a bank, and fitting the bank on a wandering arm, like a microphone boom. Fluorescent tubes are generally used with a choke starter unit from the A.C. mains, and as they are a discharge type of lamp, the current falls to zero twice per cycle and the light goes on and off 100 times per second, on a 50-cycle supply. At 16 pictures per second, when the shutter aperture exposes each frame for approximately 1/30th second, on reversal type 16 mm. film with compensated processing, there is no visible flicker on projection. On materials other than reversal stock, or at shorter shutter speeds, a flicker becomes noticeable, and it is necessary to run the tubes from the direct current. A choke is not suitable for direct current operation, and it is advisable to consult the manufacturers upon the conditions governing the running of their tubes from D.C. Warm white (Type B) fluorescent tubes are suitable for use with Kodachrome Type A film without any filter. For best results with daylight Kodachrome, however, with the daylight type fluorescent tubes, a filter is required.

Compact Source Mercury Discharge Lamps (11, 12).

The slow emulsion speed of colour film requires such a high level of illumination—often upwards of 750 foot-candles—that

it is most difficult to illuminate large areas sufficiently. For lighting large areas it is usual to use either high intensity carbon arcs, or a number of high wattage tungsten spotlights. Lighting engineers have, for a number of years, realised that high-pressure mercury vapour lamps offered great possibilities, because of the very high luminous efficiency of the larger wattage lamps. Their relative efficiency, expressed as lumens per watt, is as follows:

250 *w. general purpose tungsten lamp* . .	14
High intensity carbon arc	30
500 *w. compact source mercury arc* . .	50

Until the end of 1946, two main reasons prevented the adoption of mercury arcs for general use. Primarily, the banded spectral emission of the lamps gave a colour rendering unsuitable for colour photography, and not entirely suitable for black and white pictures, particularly where persons appeared on the screen. Secondly, there is delay in obtaining full light output after switching on and striking, and again after switching off, with the necessity for waiting until the electrodes were cool before the lamp would re-strike. These two difficulties have now been overcome and compact source lamps will undoubtedly play an important part in illumination for photography and ciné-photography in the future.

The compact source lamp consists of a roughly spherical quartz bulb containing near its centre two tungsten electrodes spaced apart by a few millimetres, between which the arc operates. The bulb contains a filling of a suitable starting gas, and a small drop of mercury (or mercury-cadmium) which evaporates completely during the normal running of the lamp. It has been found that a nearly continuous spectrum can be obtained by making large wattage lamps, of 5 kw. and 10 kw., and by the suitable addition of cadmium to the mercury. Such lamps give good rendering with various colour photographic processes.

The mercury and cadmium in the lamp evaporates completely under normal working conditions and after about ten minutes exerts a pressure of between 20 and 40 atmospheres in the bulb. When a lamp which has been operating for a period is switched off, the arc will not ignite again immediately

as the striking voltage in the de-ionised vapour is several thousands of volts. In the past, it has been necessary to wait for the lamp to cool down until the pressure falls sufficiently to enable the arc to strike again.

Fortunately, this can now be avoided in two ways. A high voltage pulse of about 30 kv. is applied across the tungsten electrodes in the bulb, which ionises the mercury-cadmium vapour and allows the arc to re-ignite. This, however, still leaves the delay in waiting for the arc to warm up. The alternative method overcomes both troubles, and in this the lamp is mounted in a glass-walled oven containing heaters above and below the bulb to maintain the temperature at its normal level of about 700° C., even though the arc is extinguished. Light may immediately be obtained by applying a high voltage impulse of about 15 kv. between an auxiliary electrode and the adjacent cathode in the bulb. Such an impulse can readily be obtained from a condenser discharge through the primary of a high tension transformer, and it ignites first the auxiliary and then the main arc.

The very high surface brightness of these arcs makes them ideally suited for use as the source in optical systems where transmitted light is used, and extremely short exposures such as in high-speed cinematography are necessary. The use of compact source lamps in projectors is also being successfully developed.

Concentrated-arc Lamps (13).

One of the most fascinating lamp developments during the war was that of small "point" source lamps of an exceedingly high surface brightness. The lamps are at present only available in relatively low wattage models, and approximate in size and shape to the average radio valve. The lamp consists of two permanent electrodes sealed into an argon-filled glass tube. On the tip of the cathode is deposited a minute spot of zirconium oxide, which reaches an incredibly high brightness when the arc is ignited. In the various sizes of lamps now made, this spot ranges from 40 to 100 candles per square millimetre in brightness and from ·005 inches to ·06 inches in diameter.

These small source lamps at present can only be made with a life of between 200 and 1,000 hours, but future research will

undoubtedly improve these figures. The uses of such small-sized lamps, which are approaching a point source, in scientific photography, are in the early stages. In experimental applications so far, the medium-sized lamps give improved rendering of detail and depth of focus in photomicrography, and with a greater life, the larger-sized lamps may well be ideal for projection.

Developments in Cameras.

The "Arriflex" (16, 17), a German 35 mm. camera of unorthodox design for "newsreel" photography during combat has several features which are most useful in scientific photography. It embodies the reflex viewfinger principle, the shutter being shaped like a dish with a polished face. During the period when the film movement is taking place, the image is reflected off the shutter and can be viewed on a ground-glass screen through a magnifying eyepiece. Thus the subject can be inspected through the actual taking lens during the whole period of filming, and a check kept on framing and focus. This type of camera would be ideal for biological and natural history photography. The "Arriflex" also has the advantage of being easily operable when held in the hand, the motor forming a grip on the base. Three lenses are mounted in a turret, and 200 ft.- and 400 ft.-magazines are available.

The British-designed combat camera, known as the Vinten "Normandy" also lends itself to photography outside the film studio. This is an exceptionally well-made camera and like the "Arriflex" carries three lenses on a turret. The field of view can either be inspected through the film or by separate viewfinder which is automatically corrected for parallax. The camera accommodates a 200-ft. magazine and uses a register pin mechanism to feed the film through the gate.

In the 16 mm. field, the Ciné Kodak Special still takes pride of place in Great Britain, and the camera and its multiplicity of accessories are in great demand. In the United States, a 16 mm. camera of even higher precision was introduced by Berndt Maurer in 1939 (18). This was basically designed to meet the demand for 16 mm. direct production to equal the quality of 35 mm. optical reduction. The 16 mm. Maurer camera has a prism type viewfinder as well as separate

external viewfinders. A dissolving shutter can be operated manually or automatically to give fades and mixes. Magazines up to 400 ft. capacity are available and the camera can function for sound recording with bilateral type variable area sound track. The early models incorporated register pins as well as a pull-down claw, but the shrinkage on 16 mm. acetate-base film was later found to be corrected better by omitting register pins and using a tapered claw which held each frame in the same relative position.

In 1946 the Mitchell Camera Company, who produce 35 mm. studio cameras extensively, produced a 16 mm. replica of their larger studio camera. This 16 mm. camera has many features similar to the Maurer camera, and is of exceptionally high-precision workmanship. These two cameras ensure that 16 mm. film production has the same quality class as the best 35 mm. results; with the lower cost of 16 mm. film stock, the portability of the cameras, and, in general, the smaller number of release prints required, they can be considered the ideal equipment for producing scientific films outside the large film studio.

In 1930, F. E. Tuttle, of Eastman Kodak Company, designed a high-speed camera using 16 mm. film which would take up to 3,000 pictures per second (23). Such a high frequency could obviously not be attained with an intermittent claw mechanism, and in Tuttle's high-speed camera, the film moves continuously. A rotating glass plate between the lens and the film displaces the image to register with the moving film, and obtains sharp pictures. The glass plate is placed inside a barrel shutter which exposes successive pictures in the normal way, and these high-speed films can be projected in a standard projector at 16 frames per second. A film taken at 3,200 pictures per second and projected at the normal rate of 16 pictures per second gives an effect of slowing down the action photographed by 200 times.

The scientific uses of such a high-speed camera for analysing very rapid movements are innumerable, and the war-time need for locating faults in quick-firing mechanisms and in automatic machines inspired the production of a revised model of Tuttle's early high-speed camera. In 1943, Eastman Kodak produced a 16 mm. high-speed camera (19, 20, 21), Type III, using the same principle as the earlier models, and

taking pictures up to 3,000 per second of a quality comparable to the results obtained with a normal ciné-camera. The scientific use of this apparatus covers a very wide range, from the study of the behaviour of a 1,000-ton press to the attitude of a fly when landing on the ceiling.

The Bell Telephone Laboratories also produced a high-speed camera called the "Fastax" (22), and using the principle of a rotating glass block; furthermore, by having the film 16 mm. wide perforated for 8 mm. cameras, the so-called Double-Eight size, this camera attained the speed of 8,000 frames per second, although the linear speed of the film was little higher than in the Eastman camera. Also, 16 mm. cameras taking pictures up to this frequency and embodying the same principles were designed in France by the Merlin and Gerlin Company, and Jean Painlevé in Paris has produced some interesting films of the locomotion of different animals.

The German high-speed cameras designed during the war were all of specialised types for analysing ballistic phenomena on short strips of film, and the results were not suitable for normal projection.

In England, Vinten produced a 35 mm. high-speed camera which would take up to 300 pictures per second. This camera used an intermittent motion with a double claw and register pins, and is of such fine workmanship that the results are indistinguishable from pictures taken at the normal speed.

Glass for Lenses and Filters.

During the war, the demand for optical glass for cameras and optical instruments necessitated the development by the Allies of alternative sources of supply, previously a virtual German monopoly. After extensive research, the Eastman Kodak Company developed a new optical glass for lens manufacture, of much higher quality and with a refractive index greater than the best ever achieved by the Germans. These glasses have made possible a range of new lenses for cinematograph cameras of superior performance; particularly worthy of mention is the new Baltar series of lenses produced by Bausch and Lomb for 16 mm. cameras.

A great British achievement lies in the production of a new heat-absorbing and heat-resisting glass, produced by Chance

Bros., under the code name ON 19 (24). Most usual light sources emit a very high proportion of their energy in the form of invisible radiation which heats up any body on which it falls. Any heat-absorbing material must necessarily become hot itself, and glass, when heated, is liable to crack: thus a heat-absorbing filter must not only remove the heat and transmit the light, but have heat-resisting properties in the form of a low thermal expansion. ON 19 has these properties to a remarkable degree and a 3 mm. thickness will transmit 87 per cent of the light and only 8·5 per cent of the heat. The thermal expansion is extremely low, and the glass is colourless and completely durable.

ON 19 has been found useful in many of the new cinematograph and film-strip projectors, allowing a projection lamp of higher wattage to be used without increasing the possibility of damage to the film. Other uses in scientific photography are many, particularly in photo-micrography of living cells and tissues, and in medical photography, to avoid scorching the skin of the subject by the use of light sources of high intensity.

Lenses (29).

In 1892, H. Denis Taylor of T. Cooke and Sons, York, made some experiments in coating lenses (30) with an extremely thin transparent layer on the surface, in order to reduce the reflectivity of the glass and thus to increase the transmission of a lens considerably. From calculation, it is found that there is no reflection of a ray if the thickness of the film is one quarter of the wave-length of the incident light. These early experiments were not successful in producing a sufficiently durable layer to make this knowledge a practical possibility.

Magnesium fluoride and several other minerals have refractive indices which are of the correct magnitude to suit optical glasses, and in 1939 it was found possible to deposit these as a film by volatilisation in a high vacuum (26, 27, 28). When the mineral is heated to a red heat at an extremely low vacuum, it volatilises and travels until it meets a cool surface, where it condenses as a transparent film. To make the thickness one quarter of the desired wavelength is an easy matter. The colour of the reflection of a white light from the film can be

seen to change as the film grows on the lens, and the evaporation is stopped by releasing the vacuum at the colour required.

Nearly all lenses produced since 1940 have their surfaces treated by this method. The efficiency of the coating gives an increase of 25 per cent in the brightness of the image in the camera, formed by a lens having eight coated surfaces, and this results in a picture of considerably increased contrast.

Lenses have not materially changed for a large number of years, and "zoom" lenses were known before the war. In a "zoom" lens, the focal length is variable at the turn of a ring and the plane of focus remains undisturbed. This gives the effect on the screen of a rapid track towards or away from the subject, which remains exactly in focus. The pre-war "zoom" lenses used a mechanical principle, in which the focusing ring was altered by a cam from the ring which changed the focal length. Early in 1947, a "zoom" lens was introduced in the United States which altered the focal length and kept the correct plane of focus by an optical method, in the manner of a variable power telescope (25). This lens was designed by Dr. Frank G. Buck, and a model is available for both 35 mm. and 16 mm. cameras.

Sensitometry and Processing.

The production of higher quality release prints in both 16 mm. and 35 mm. requires more accurate control in the processing, and it is now becoming the general practice to make regular measurements of the pH or alkalinity of the developer to determine the proportion of metol, hydroquinone, sodium sulphate, and potassium bromide (31, 32, 33). The Eastman Kodak Company has recently published data concerning the effect upon development of varying the quantities of these four chemicals and of varying pH (34).

Together with these advances, more sensitometric strips are being used for the routine control and determination of the gamma of processed films, and a number of improvements have taken place in the design of sensitometers. Ilford in this country, and Western Electric (35) and Ansco (36, 37) in the United States, have produced electronic densitometers in which density readings are given directly on the scale of a micro-ammeter, thus avoiding errors due to the observer and

saving the tiring eyestrain of making many hundreds of visual observations daily.

A practice which will revolutionise the processing of motion picture film is gradually coming into favour in many countries. This is to spray the solutions on to the film under pressure, instead of passing the film through the processing bath (38). The chief advantage of this new method is that in the developer, the directional effects due to local exhaustion of the developing solution are avoided. As the speeds of developing machines increased to obtain greater production, it was found that such directional effects became worse, particularly in variable area sound tracks, but this new method enables film to be processed up to 200 feet per minute with completely satisfactory results.

Splicers for Joining 16 *mm. and* 35 *mm. Film.*

An exceptionally efficient joining press for motion film has recently been marketed in Great Britain (40), and a somewhat similar machine is available in America (39).

The British model is made with fine precision and the cutting blades are ground to within ·0002 inches. It is adaptable to either 35 mm. or 16 mm. film by means of retractable pins and special allowance is made for stock shrinkage. An incorporated electric heater ensures rapid drying of the cement.

A splicer using an entirely different method of joining, marketed in the United States, is the Lektra Splicemaster for 16 mm. film. This welds the film along the joint by means of an electric arc, but the writer has no personal knowledge of this machine at the time of writing.

An article which is not available and is greatly needed is a film cement which is entirely free from acetic acid, for joining 16 mm. acetate base Kodachrome film. Those at present available all contain some small amount of acetic acid, and this has a purple staining effect on the colour film dyes near the splice. It is to be hoped that some manufacturer finds this subject worthy of research.

Specialised Methods, Techniques and Apparatus (44, 45, 47, 48, 51, 54).

1. Two methods have been described for *increasing the depth of field of motion picture camera lenses.* The first method, designed

by Goldsmith (46), was based on the division of the motion picture set into optically appropriate regions, with the illumination in each region being exactly similar. The identification and differential focusing over the area were made in the camera, covering all regional images within a single exposure. These experiments have not as yet been seen in Great Britain nor another method developed by Bausch and Lomb and demonstrated in the United States (49), in which the lens oscillates about 23,000 times per minute in a plane of ·3 mm. depth on the lens axis.

2. A great deal of work has been done on *underwater cinematography*; Johnson has published an exceptionally good report on such techniques in 1939 (50), describing suitable apparatus with details of submergible lights and cameras, with physical information on those properties of water, which necessitate filters for avoiding the scattering of light in water (55).

3. An instrument for *measuring the pitch of* 35 *mm. film* (56) was specially designed for calibrating very old and shrunken materials by L. J. Wheeler, and presented to the National Film Library in 1943.

4. The majority of optical instruments where inspection is through an eyepiece can be used by only one observer at a time, and the recording by cinematography of a subject viewed down such instruments as *periscopes, endoscopes and bronchoscopes*, has long been of great interest, particularly to medical film makers (41, 42, 43, 52, 53). A surgeon inspecting many patients each day in differing conditions of health must retain in his memory an exact picture of the state of the tissues of each patient from week to week or possibly over many months. The advantage of a colour photographic record is obvious, and a number of techniques have been suggested and applied.

Because of the small physical dimensions of most types of such inspection equipment, and the small optical aperture available, the major difficulty in taking cinematograph pictures down the eyepiece is to obtain sufficient illumination of the subject, particularly when using the less sensitive colour materials. Several cleverly designed systems have been described, by which the illumination from a high intensity source is transmitted to the subject along the same path as that used by the camera lens. This is obtained by placing a half-silvered

mirror at 45° in front of the eyepiece, so that the camera axis and the axis of illumination from the lamp are at 90° to each other. The disadvantage of transmitting the illumination down the eyepiece is that there is a considerable light loss before reaching the subject, not only because of the small optical aperture of the system, but also of the number of lenses through which the illumination has to pass.

Lamp manufacturers have recently designed a number of bulbs of considerable candle power and extremely small dimensions, and it is likely that some of these are sufficiently small to be placed at the end of the examining instrument and lighted very near to the subject. Another method is to transmit the illumination from an external source, via a circular section rod of transparent plastic material, which has the ability to act as a pipe for light. Apparatus designed during the war, using this technique for the inspection of the inside walls of rifle barrels, might well be adapted for the foregoing purposes of scientific cinematography.

Film-Strip Projectors (57).

The increasingly popular use of 35 mm. film strips as a visual teaching aid has naturally produced in Great Britain and in the United States a large number of different types of projector, by many different makers. The design of these projectors is in general very similar to the 2 in. x 2 in. miniature lantern projectors, popular before the war for projecting Kodachrome and Agfacolor transparencies. The great improvement has been in light output, and most of the manufacturers have aimed at including very high wattage bulbs, at the same time permitting a slide to be held in the gate for up to two minutes without being damaged. Bell and Howell produced in 1941 the remarkable "Filmo Slidemaster" for 2-inch-square (5-cm.-square) slides, which incorporated a 1,000-watt lamp, and a fan to cool the faces of the slide and the bulb in its housing. The light output from this model has only recently been improved upon by an Eastman Kodak projector for 2-inch-square slides, which also uses a fan and a 1,000-watt lamp, but by superior optical design and coating all the lenses (including the condenser lenses), gives an even brighter picture.

A number of excellent film-strip projectors for classroom use

are available in Great Britain, and each has certain details in its favour. The Dufay-Chromex projector illustrated on Plate 29 is typical of the pleasing lines and high finish of the new projectors.

An interesting development in the use of film strips for teaching has been made possible by the Synchrophone (58). This apparatus combines visual and aural teaching. It consists of a glass screen inside a frame on which a series of pictures in colour are projected in succession, and a gramophone which provides a description and discussion of each picture as it appears. As the pictures are visible in broad daylight and each remains on the screen for several seconds, the Synchrophone is, in some ways, better adapted than the cinema for class instruction. In giving a first lesson, the teacher may cut out the gramophone and make his own comments on the pictures, retarding the changes of picture at will. After that introduction, the lesson may be repeated by gramophone as often as desired. The British Military Authorities made considerable and very effective use of the Synchrophone for the instruction of unskilled personnel, and experience has shown that pictures presented in this way make a deep and lasting impression on the memory. A comparable piece of equipment, the "Explainette", has been produced in the United States.

Two interesting film strip and 2-inch-square slide projectors were demonstrated in Chicago in 1941, one by the Society for Visual Education and the other by the Three-Dimensional Corporation. These projectors were twin-lens stereo models, using polaroid filters over each lens and polarising filters in spectacles for each member of the audience. A disadvantage of this method of stereoscopic projection is that at only one distance from the screen is a true perspective obtained, a disadvantage shared with the anaglyph technique for stereoscopic projection (Plate 30).

Stereoscopic Cinematography.

The three great phases of cinematographic verisimilitude have been successively movement, sound and colour. The fourth development, stereoscopic cinematography, is in its infancy as an entertainment, and has not been used as yet as a scientific tool.

Opinions on the merit of stereoscopic cinematography are greatly divided, and many people feel stereoscopy to be an

unnecessary refinement. Dr. C. E. K. Mees, Director of Research for the Eastman Kodak Company, who has instigated more research into photography than any other individual, does not consider that research work on stereoscopy merits immediate attention.

Moscow is the only city in the world to have a public cinema equipped for the projection of stereoscopic films (59, 60). The method used in this new cinema, which seats 180 persons, requires elaborate equipment and it is necessary to retain the head in a steady position to continue the illusion of stereoscopy. The first film shown in this new cinema was in March 1947, and made by Ivanov from the celebrated novel *Robinson Crusoe*. A series of further films is planned for future production.

Cinematograph Projectors (61, 62).

Sixteen mm. films only became generally recognised as something more than an amateur interest with the advent of the war. When millions of factory workers and servicemen had to be trained for their new jobs in the shortest possible time, training films became one of the most efficient teaching methods. The advantages of the more portable and non-inflammable 16 mm. film were obvious, particularly in regard to the cost of prints. In Great Britain and America, the companies which had produced 16 mm. sound projectors before the war, were called upon for mass production of an article of professional quality, sufficiently robust to withstand the wear and tear of transport all over the world in mobile projection units. These projectors had to function from the Arctic to the Sahara desert; to have readily interchangeable parts and be simple to maintain and operate. The various Services laid down standards of performance which were rigid and based on practical experience, and this work has had a lasting impression upon the design of projectors for the future (63).

Teaching and training films are now being used in their peace-time role of instructing children, factory workers, scientific and medical men and, in fact, everyone who is concerned in the progress of social groups to-day. In war-time, price was not the most important factor, but to-day a range of efficient but lower-priced models has been marketed. These are particularly suited for use in the medium-sized classroom where

only a small picture and low sound output are required, whereas larger-sized models are capable of showing a picture for an audience of up to a thousand persons.

There have been no radical improvements in 16 mm. projector design, but nearly every item has been better designed on nearly all the models marketed. Careful thought on the best position for each component has made projectors easier to thread and operate, and a number of bodies as well as the official organisations have issued standards and basic requirements. In general, claw and gate mechanisms tend to scratch and wear the film less, and the sound head can be more easily cleaned and adjusted. A bright picture is far easier to watch, and most projectors take at least a 750-watt lamp and use large-aperture coated lenses. In the United States, 1,200-watt tungsten lamps are available and for very large audiences there are several 16-mm. projectors using an arc.

The valves of smaller dimensions which are now common in portable and midget radio sets have been used to decrease the size and weight of sound projector amplifiers, and many projectors are now fitted into a box which can be conveniently carried around like a medium-sized suitcase.

It can be said that 16-mm. sound and silent projectors are now available at a reasonable price and of a high quality commensurate with the current improvements in films, cameras and substandard cinema technique.

It is not easy to forecast by way of conclusion, what further advances may be looked for on the technical side. We await fuller news of developments in those countries cut off by the war from scientific inter-communication and we look forward to the stimulus of such free exchange in developing both the photographic and the projection aspects of cinematography.

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SCRIPT AND SCIENCE

DENYS PARSONS, M.Sc., A.R.I.C.,
Realist Film Unit, London.

THE SCRIPT writer does not invariably know what resources he can command for securing information, particularly when he is faced with bibliographic and documentary research into a problem of a scientific or technical nature. The purpose of this contribution is to give some information about such sources for facts, and to make some suggestions for procedure. It is addressed primarily to technicians entering the field of scientific film production, but may be of use to workers who have the task of presenting Science or documentary material through other "mass media", such as the press and radio.

For the preparation of the script of nearly every scientific film some research is necessary. Even if an expert with unlimited leisure were available, which is most unlikely, it is desirable that the scripter[1] should become as far as possible self-supporting. It is impossible to write a technical script or to direct a technical film adequately without a complete grasp of the subject-matter. Perfunctory research is not enough and though a film may ultimately appear very simple, it probably did not start so. The few aspects presented may have been chosen from some dozens of suitable ones, selected from perhaps hundreds of possible ones. Before that selection can be made the whole field has to be fully explored; the fuller the exploration the more confident and pertinent will be the final selection. Another advantage of thorough preliminary research is that it greatly simplifies the subsequent problems of editing teaching-notes, charts, and film-strips, which with the increased emphasis on Visual Units, are likely nowadays to come increasingly within the province of the scripter.

[1] For brevity the script-writer or script-writer-director will be referred to as the scripter.

The essential preliminary to any research problem is a search of the literature. First would come a superficial reconnaissance; for a "bird's-eye view" of a subject the *Encyclopædia Britannica* is not to be despised. The latest revision of this work was in 1945, and supplementary volumes are issued at intervals. It is also convenient to have access to a medical and scientific library, of the type which caters for University students. Many Borough Public Libraries maintain a technical section and can make arrangements for technical books to be obtained from specialist libraries.

No rigid order need be laid down for the various stages of the research, but a second step may well be to consult an appropriate expert. (A certain amount of preliminary reading should precede this so that the expert's recommendations can be comprehended.) Often the sponsor has provided an expert, but it is seldom that a single specialist will be able to cover all the topics which a particular treatment calls for.

There are several ways of finding the appropriate experts. In countries where there is a Scientific Film Association, one of its stated aims is likely to be, as in the words of the British body: "to organise a representative panel of scientists to advise producers of films of all types on scientific matters". For example, on the medical committee of the Scientific Film Association in Britain there are qualified doctors who will advise on medical points which arise in a script, or recommend an expert. Another line of approach is through one of the learned bodies or research organisations. These are listed for fifty-two countries in *World of Learning* (Europa Publications Ltd., London, 1947). In some cases, as in Britain, Canada, and Australia, a number of research organisations are grouped together under a (Government) Department of Scientific and Industrial Research.[1]

Trade and Manufacturers' Associations may also be a fruitful source of information—for instance, who would guess the existence of an Association of Short-Circuit Testing Authorities, and a Large Black Pig Society?; the number and diversity of these is always a surprise. Sometimes a telephone call to a particular industrial firm may be indicated.[2] Experts on a

[1] See References p. 93.

[2] The technical staff of very large industrial concerns should be approached through their Publicity or Public Relations Department.

very wide range of subjects are to be found among the staffs of Universities and Colleges. The academic staffs of all universities are listed in *World of Learning*.

A second opinion is always useful for discovering a different point of view on a subject, and it is always well to verify factual information, even if it is obtained from experts.

After consultations with the experts, the field to be covered should be known and now it is necessary to acquire some mastery of the subject. In most cases this means a much fuller and more methodical study of the literature. The larger science libraries should be sought out, particularly those which have scientific periodicals. The library of the British Patent Office, for example, has a magnificent range of the scientific and trade journals of many countries as well as British and foreign patent specifications.

There are also smaller libraries dealing with specialised subjects. Nearly every learned body has its own library to which access is possible, either direct or through a member. There are also still smaller specialist libraries of trade organisations. Large industrial concerns often have very complete reference libraries and may maintain abstracting services.

A large reference library is often extremely useful for script research, and large libraries are often the easiest to use once the scripter familiarises himself with their particular lay-out. A few of them, such as the British Museum Library, have the great advantage that the book required is almost certain to be available, since books may not be taken away. Dingwall points out in *How to Use a Large Library* (1933) that the research worker will miss a great deal unless he learns to make intelligent use of the various catalogues and he explains how they should be used. Before consulting the subject-indexes it is advisable to look at the *World Bibliography of Bibliographies* (Th. Besterman, 2nd Edition, 1947–8). If a bibliography of the subject exists, a great deal of time will be saved. Libraries of any size in all countries have a set of the subject catalogues to the British Museum Library. They date from 1881 to the present day and will be found of value even if there is not ready access to this Library.

There are several guides to the literature of periodicals. Three useful ones are: the *Royal Society's Catalogue of Scientific*

Papers from 1800 to 1900; the indexes from 1882 to the *Journal of the Society of Chemical Industry*, and the *International Index to Periodical Literature* which extends from 1930 to the present day. There is also an important German index (see Dingwall's book). *The World List of Scientific Periodicals* (1934)[1] gives their location in libraries.

Museums are a help in studying the historical side of a subject. (Museums and libraries of fifty-two countries are listed in *World of Learning*.) Often the lesser-known public museums are worth visiting, and many small private museums are to be found on the premises of learned bodies, industrial firms, and in unexpected places. The curators and staff of museums are often subject experts and are in constant touch with other leading savants in the same field.[2] A fascinating book may be mentioned in connection with historical research[3]—*A Pictorial History of Chemistry*, by F. Ferchl and A. Süssenguth (English translation, 1939). Its text will help in scripting certain films and the illustrations will be found invaluable at a later stage for setting up apparatus and backgrounds for historical experiments (see Fig. 6, p. 92).

A free research service is offered by Encyclopædia Britannica Ltd. to all its subscribers. A limited amount of research, on a coupon system, will be undertaken and a report presented. The investigation is done by trained librarians and the report is mainly a digest of articles in reference works. On the whole it seems that this service will find best application in less technical fields, at least as far as films are concerned.

An aspect of the investigation which should not be neglected is the viewing of all films that have been made on the subject in hand. The purpose of viewing old films is three-fold—(i) to avoid unnecessary duplication where an earlier film has *satisfactorily* covered the whole or part of the subject-matter; (ii) to avoid any errors made in the earlier film and to profit by some of the good points; (iii) so that the possibility of ordering a duplicate negative of certain unique shots in it may be considered.

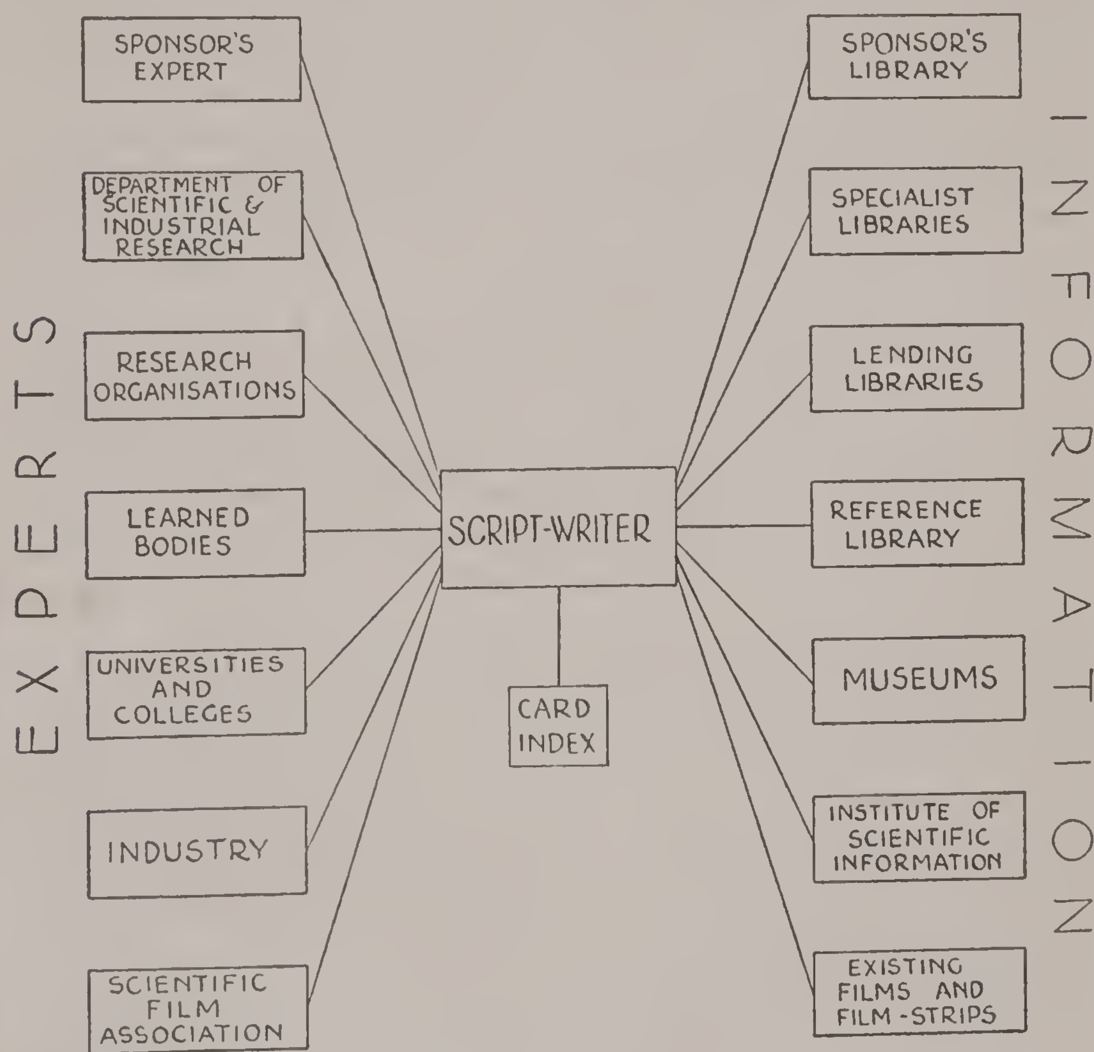
[1] Third edition in preparation. *The British Union Catalogue of Periodicals* when published (by ASLIB) will do the same for British libraries only.

[2] A British Society for the History of Science has recently been formed. Temporary address: Ravensmead, Keston, Kent.

[3] The literature on the history of science is very large. A useful guide to it will be found in a bibliographical note at the end of *Science since 1500* by H. T. Pledge, B.A. (H.M. Stationery Office, 1939, 10*s*.)

It is seldom safe to assume that no films have been made on a given subject. For example, there are in existence at least thirteen films on Common Salt. After the national catalogues of films have been scrutinised an effort should be made to gain access to foreign catalogues.

There are certain further preliminaries to writing the script which are beyond the scope of this article. The audience for which the film is intended—in the case of schools the age-group, and the purpose of the film, must be kept in mind; manner of presentation and balance must be carefully planned. Such considerations may indeed influence the direction and extent of script research. If the film centres on an instrument



The Script-writer's Sources of Scientific Information.

FIG. 6.

or technique, the scripter should, so far as is practicable, become master of that instrument or technique.

While working on particular detail the scripter should try not to lose sight of the general aspect. It is important to keep abreast of modern scientific developments, and a subscription to one or more of the better popular-scientific journals will be of great use. Finally, the importance of building up one's own information bureau, preferably in the form of a card-index, cannot be over-emphasised. An index which has acquired only two hundred cards already begins to be useful, and as it gets bigger will become indispensable.

The subject matter of many scientific films fits them for education throughout the world, and duplication of effort at an international level would be even more regrettable than *intra*-national overlapping. It is hoped that the efforts now being made by UNESCO to facilitate the international exchange of scientific information in general and of visual aids in particular, will soon bear fruit.[1]

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Nature, weekly, Macmillan and Co., Ltd., St. Martin's Lane, London, W.C.1. 50*s*. yearly. This journal is more academic.

British Science News, monthly, British Council, 3 Hanover Street, London, W.1. 10*s*. annually in Britain.

[1] It is already possible to get specified films from many countries; apply to the International Committee of the Scientific Films Association.

Science News, Penguin Press, intermittently. 1*s*. 6*d*.
New Biology, Penguin Press, intermittently. 1*s*. 6*d*.

Libraries.

Science Library, Imperial Institute Road, London, S.W.7. *Tel.:* Kensington 6371.

Administered by the Ministry of Education; admission by signature of visitors' book; books may be borrowed only by approved and recommended individuals, or by educational or bibliographic organisations. *Catalogue* maintained on the Universal Decimal System; scientific periodicals, British and overseas.

Patent Office Library, Southampton Buildings, Chancery Lane, London, W.C.2. *Tel.:* Holborn 8721.

British and overseas patent specifications and periodicals; books on applied science.

British Museum Reading Room, Bloomsbury, London, W.C.1.

Reader's ticket, available for six months, obtainable on written application to the Director, together with a recommendation from a person of responsibility; in general permission given to those engaged on serious enquiry, who cannot obtain readily elsewhere the required books.

Specialist Libraries.

(i) *Association of Specialised Libraries and Information Bureau* (ASLIB), 52 Bloomsbury Street, London, W.C.1. *Tel.:* Museum 7534. Director, Miss E. Ditmas.

Issues guides to sources of specialised information and lists of books on technical subjects, in accordance with its stated function, "to facilitate the co-ordination and systematic use of sources of knowledge and information in all public affairs, and in industry and commerce, and in all the arts and sciences".

(ii) *Institute of Scientific Information*, British Association for the Advancement of Science, Burlington House, Piccadilly, London, W.1.

This is in process of being set up to "maintain a record of all scientific research in Great Britain and in the world as a whole, for supply to the Press, the British Broadcasting Corporation, and other mass media".

(iii) *Learned Societies, etc.*

Libraries maintained by learned societies, chiefly for the use of their members, and other organisations, include the following:

Government Departments generally: for information apply in the first place to the Information Officer or the Public Relations Officer.

Admiralty, Whitehall, London, S.W.1. *Tel.:* Whitehall 9000. Librarian, D. Bonner-Smith.

Chemical Society, Burlington House, Piccadilly, London, W.1. *Tel.:* Regent 1675. Librarian, A. E. Cummins.

Geological Survey, Geological Museum, Exhibition Road, London, S.W.7. *Tel.:* Kensington 9441. Librarian, R. Reeley.

Imperial Institute, Imperial Institute Road, London, S.W.7. *Tel.:* Kensington 3264. Librarian, W. F. Miller.

Linnean Society, Burlington House, London, W.1. *Tel.:* Regent 1040. Librarian, S. Savage.

Ministry of Education, Belgrave Square, London, W.1. *Tel.:* Sloane 4522. Librarian, Miss D. F. Shuckburgh.

National Institute of Industrial Psychology, Aldwych House, Aldwych, London, W.C.2. *Tel.:* Holborn 2277. Librarian, Miss J. Hilton.

Royal Geographical Society, 1 Kensington Gore, London, S.W.7. *Tel.:* Kensington 5466. Librarian, G. R. Crone.

Royal Institute of British Architects, 66 Portland Place, London, W.1. *Tel.:* Welbeck 5721. Librarian, R. E. Enthoven.

RESEARCH ORGANISATIONS.

Department of Scientific and Industrial Research, 24 Rutland Gate, London, S.W.7. *Tel.:* Kensington 9022. Intelligence Division, Films Officer, B. Hogben.

The following research establishments are maintained:

National Physical Laboratory, Teddington, Middlesex. Director, Sir Charles Darwin, F.R.S.

Undertakes national research work in aerodynamics, electricity, engineering, light, metallurgy, metrology, physics, ship design and mathematics.

Radio Research Laboratory, Teddington, Middlesex. Director, Dr. R. L. Smith-Rose.

Fuel Research Station, River Way, Blackwall Lane, East Greenwich, London, S.E.10. Director, Dr. A. Parker.

Investigations on the nature, preparation and utilisation of fuel.

Building Research Station, Bucknall's Lane, Garston, Near Watford. Director, Dr. F. M. Lea.

Investigates building materials and methods of construction.

Chemical Research Laboratory, Teddington, Middlesex. Director, Dr. R. P. Linstead, F.R.S.

Work on high-pressure gas reactions, synthetic resins, tars from low-temperature distillation of coal, corrosion and microbiology.

Pest Infestation Laboratory, London Road, Slough. Director, G. V. B. Herford, O.B.E.

Experimental study of infestation of produce by insects and similar pests.

Forest Products Research Laboratory, Princes Risborough, Aylesbury, Bucks. Director, Dr. F. Y. Henderson.

Investigation on seasoning, preservation, strength values and structure of wood.

Water Pollution Research Laboratory, Langley Road, Watford. Director, Dr. B. A. Southgate.

Research on the purification of rivers and other sources of water supply.

Food Investigation Laboratories, Low Temperature Research Station, Downing Street, Cambridge. Director of Food Investigation, Dr. C. S. Haines; Superintendent of the Laboratory, Dr. F. Kidd, F.R.S.

Storage and transport of foodstuffs, especially dehydration. Laboratories at Ditton, near Maidstone, are concerned with fruit, and at Aberdeen, with fish.

Geological Survey and Museum, Exhibition Road, London, S.W.7. Director, Dr. W. F. P. McLintock.

Continuous survey of the geology of Great Britain.

Road Research Laboratory, Harmondsworth, Middlesex. Director, Dr. W. H. Glanville.

Investigations on improvement of materials and methods in road construction, and road safety.

The following research establishments are maintained by the interested organisations, with subsidies from the Department of Scientific and Industrial Research:

British Boot, Shoe and Allied Trades Research Association, Satra House, Rockingham Road, Kettering, Northants. *Tel.:* Kettering 3151. Director, H. Bradley.

British Cast Iron Research Association, Alvechurch, Birmingham. *Tel.:* Redditch 716. Director, J. G. Pearce.

British Coal Utilisation Research Association, 13 Grosvenor Gardens, London, S.W.1. *Tel.:* Victoria 1534.

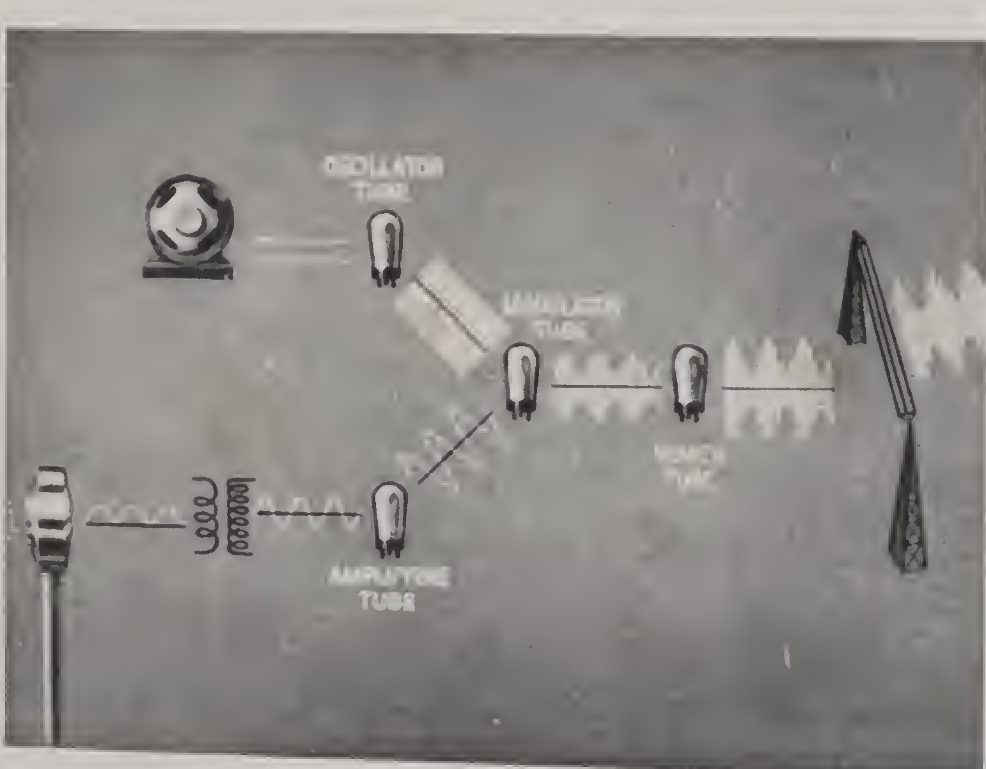
Director of Laboratories, Dr. D. T. A. Townend, Randall's Road, Leatherhead, Surrey. *Tel.:* Leatherhead 3591. Library, Pebble Combe, near Tadworth, Surrey.

British Hat and Allied Feltmakers Research Association, 12 St. Peter's Square, Stockport. *Tel.:* Stockport 2622. Director, Dr. T. Barr.

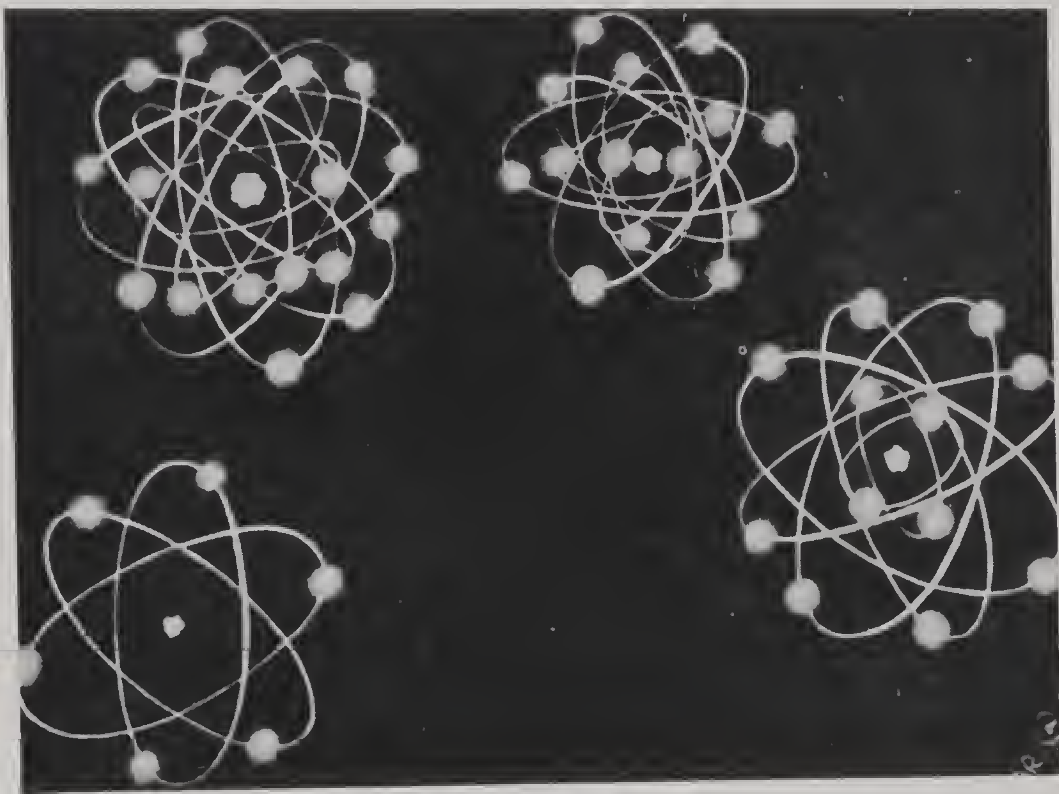
British Gelatine and Glue Research Association, Sardinia House, 52 Lincoln's Inn Fields, London, W.C.2.

British Coke Research Association, 11 Pall Mall, London, S.W.1. *Tel.:* Abbey 6772. Director, G. W. Lee.

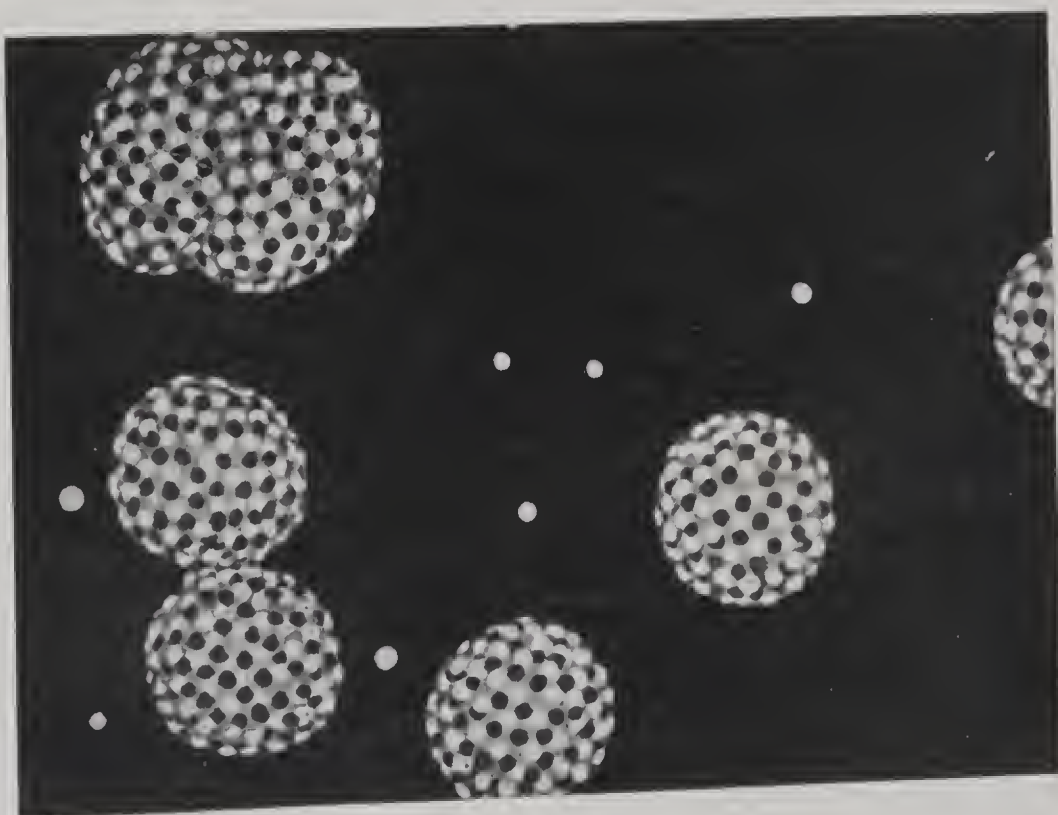
ELECTRONS.
(*Encyclopædia Britannica Films, Inc., U.S.A.*)



SENDING RADIO MESSAGES.
(*Encyclopædia Britannica Films, Inc., U.S.A.*)

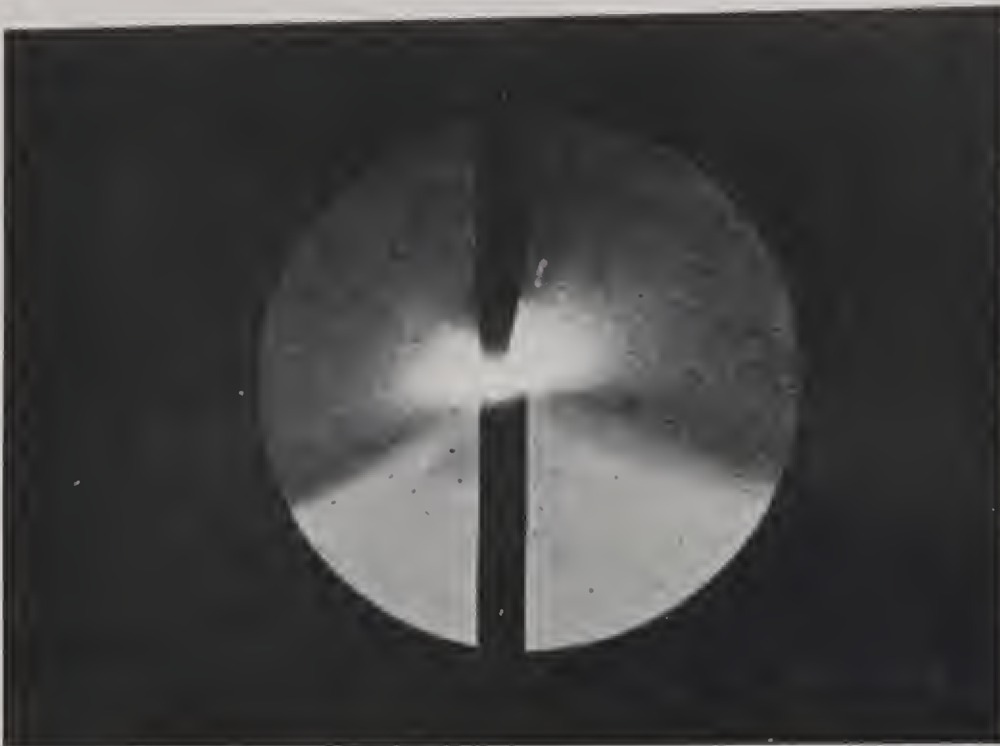


ATOMIC ENERGY: Structure of various atoms, with planetary electrons rotating around their nuclei.



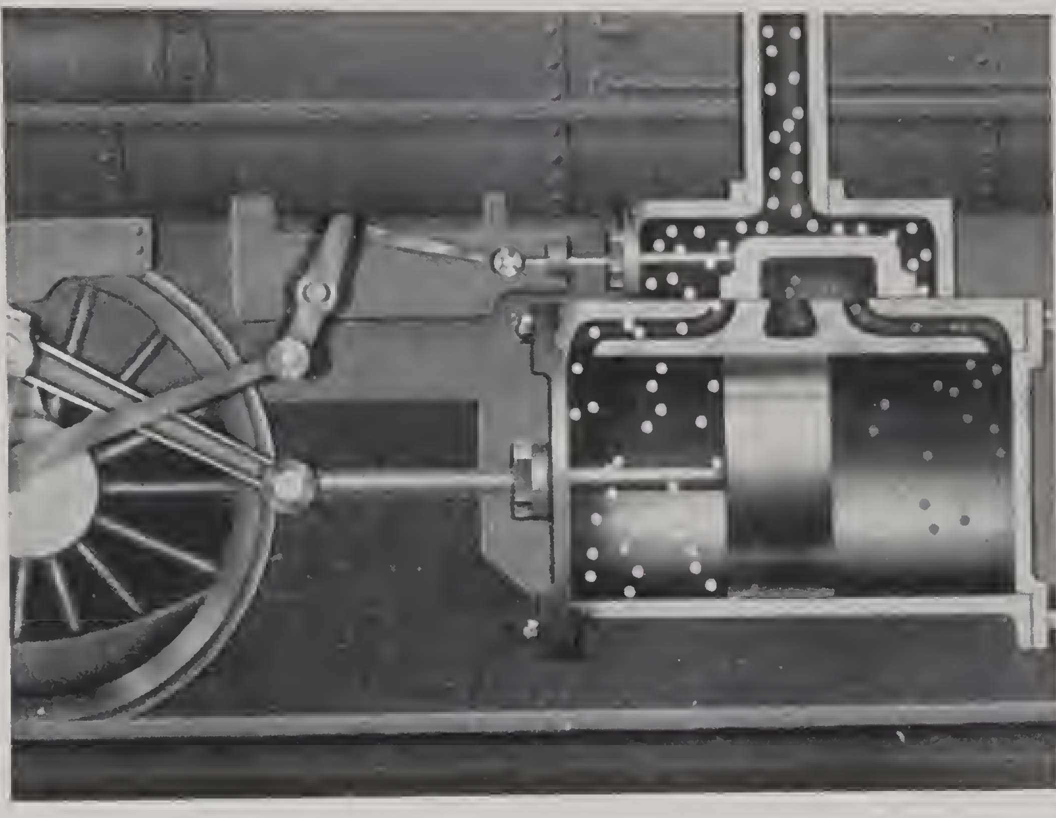
ATOMIC ENERGY: Bombardment of uranium by neutrons, causing atomic fission with production of more neutrons, which in turn cause further fission; thus a chain reaction is set up.

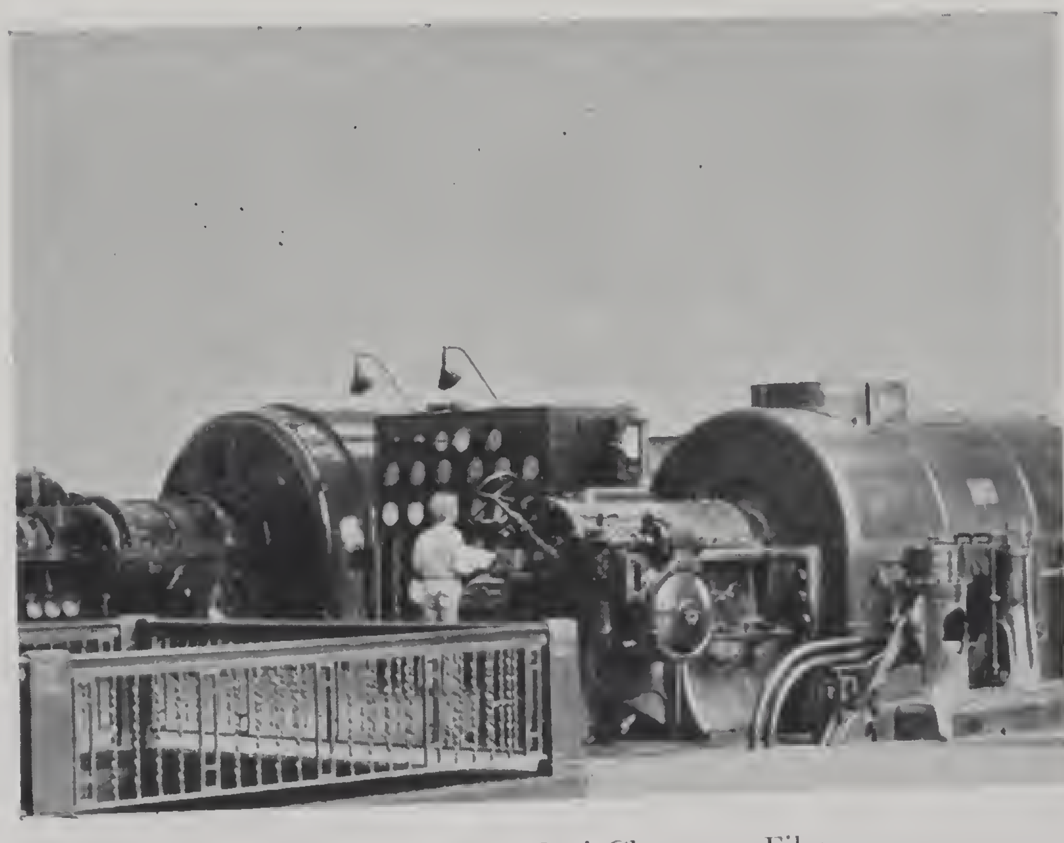
(Encyclopædia Britannica Films, Inc., U.S.A.)



COLLOIDS IN MEDICINE: Preparation of a metallic colloid by striking an electric arc under water between electrodes of the metal; colloidal particles are seen streaming away from the arc. Modern chemical methods are more refined, and the colloids so produced are not accompanied by larger particles.
(Crookes Laboratories Ltd., Great Britain.)

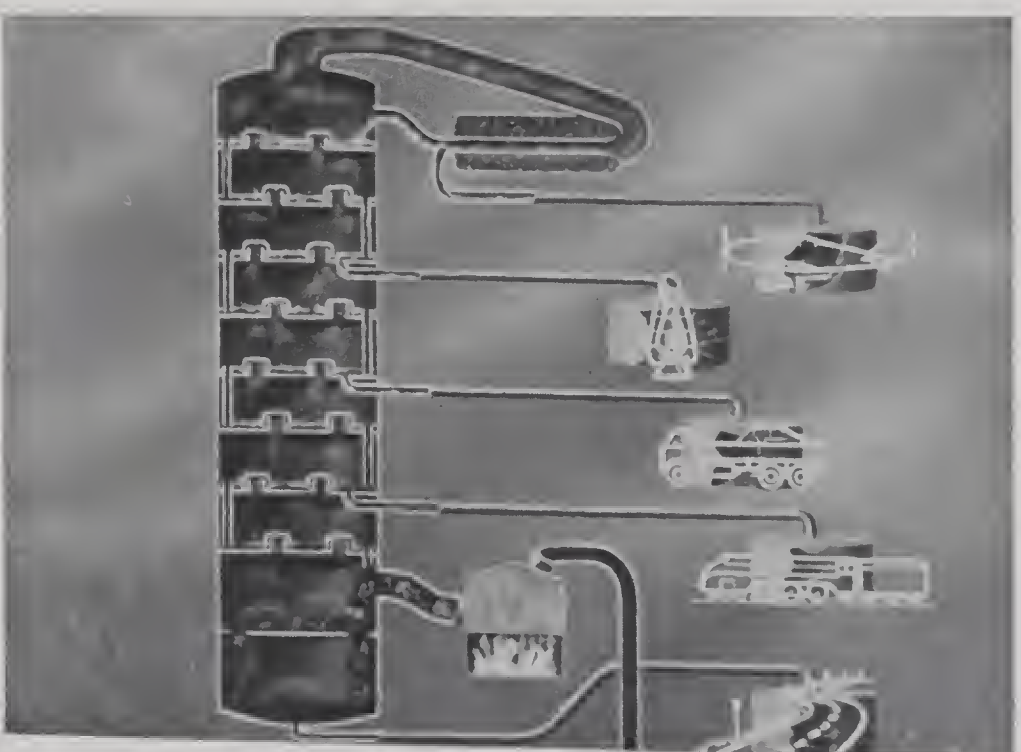
COLLOIDS IN MEDICINE: Silver, mercury and antimony are among many colloids used in medicine; preparations are seen here on a moving belt.
(Crookes Laboratories Ltd., Great Britain.)





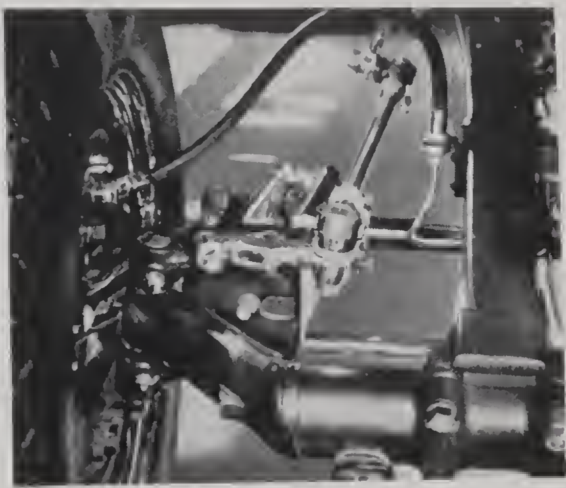
THERMODYNAMICS: Erpi Classroom Film.
(Encyclopædia Britannica Films, Inc., U.S.A.)

DISTRIBUTING HEAT ENERGY: An Erpi Classroom Film.
(*Encyclopædia Britannica Films, Inc., U.S.A.*)



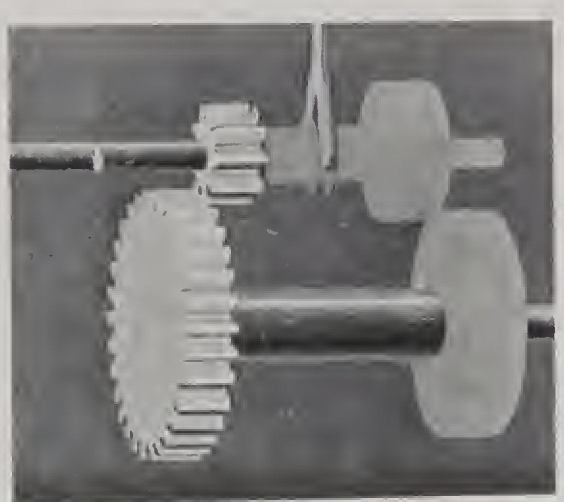
DISTILLATION: Diagram of a distilling tower.
(*Shell Petroleum Co., Ltd., London.*)

PLATE XXXVIII

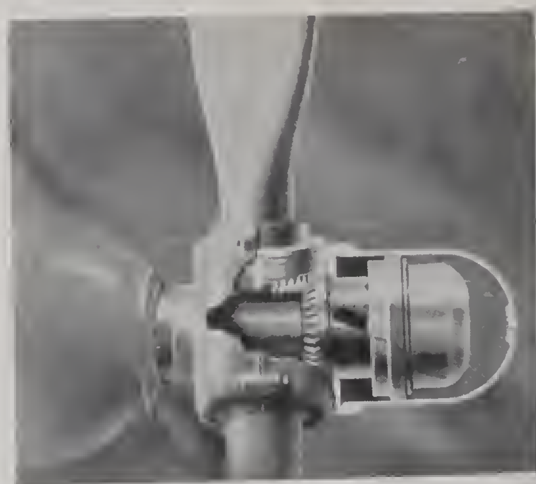


(*a*) SPRINGS.

(*b*) HYDRAULICS.



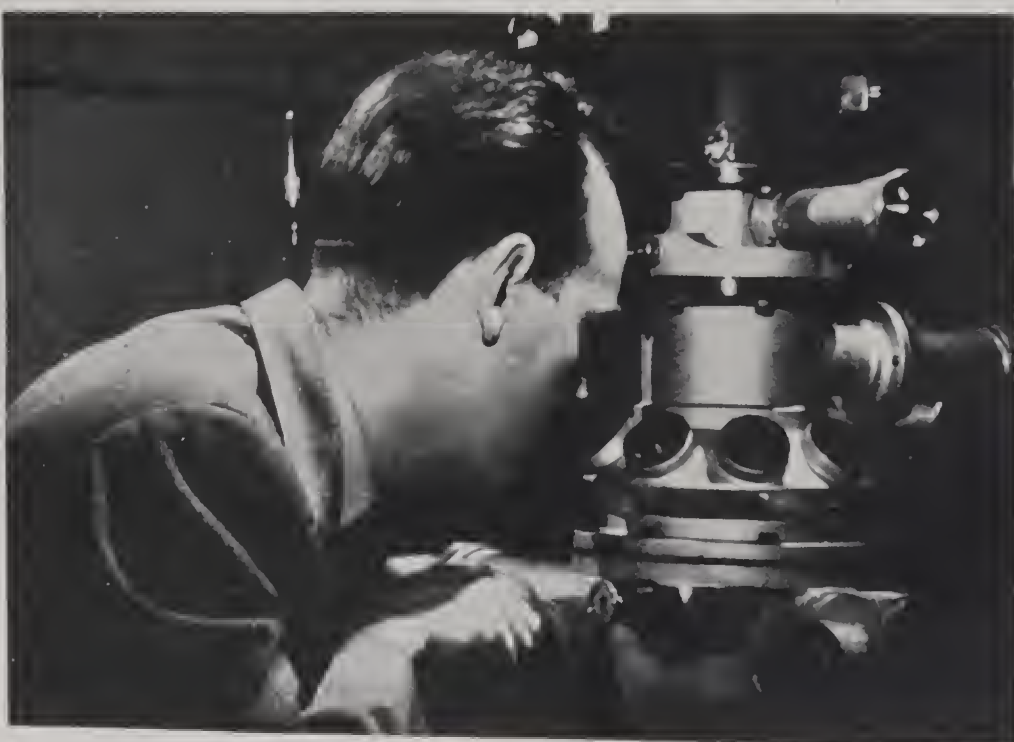
(*c*) TRANSFER OF POWER.



(*d*) AIRSCREW.

(*From four films by Shell Petroleum Co., Ltd.*)

HOW TO FILE.
(*Shell Petroleum Co., Ltd., London.*)



UNIVERSITIES AT WAR: A view of the electron microscope, University of Toronto.
(*National Film Board of Canada.*)

IT COMES FROM COAL: Analysis of coal gases.
(*British Gas Council.*)

THE WELDING POOL: A still picture of a weld in progress as seen through the welder's goggles. This still picture is intended to supplement films on welding, such as *Elementary Oxy-acetylene Welding.*
(*British Oxygen Co., Ltd.*)

British Cotton Industry Research Association, Shirley Institute, Didsbury, Manchester. *Tel.:* Didsbury 2401. Director, Dr. F. C. Toy.

British Electrical and Allied Industries Research Association, 15 Savoy Street, London, W.C.2. *Tel.:* Temple Bar 7907. Director of Laboratories, Dr. S. Whitehead, 5 Madsworth Road, Perivale, Greenford, Middlesex. *Tel.:* Perivale 4401.

Research Association of Flour Millers, 17 St. Matthews Avenue, Surbiton, Surrey. *Tel.:* Elmbridge 3759. Director of Laboratories, Dr. T. Moran, Old London Road, St. Albans, Herts. *Tel.*: St. Albans 640.

British Food Manufacturing Industries' Research Association, 2 Dalmeny Avenue, London, N.7. *Tel.:* North 1048. Director, Dr. L. E. Campbell.

Gas Research Board, 1 Grosvenor Place, London, S.W.1. *Tel.:* Sloane 8266. Director, Dr. J. G. King.

British Internal Combustion Engine Research Association, 111 Buckingham Avenue, Trading Estate, Slough, Bucks. *Tel.:* Slough 20295. Director, Eng.-Rear-Adm. D. J. Hoare.

British Iron and Steel Research Association, 11 Park Lane, London, W.1. *Tel.:* Grosvenor 4751. Director, Sir Charles Goodeve, F.R.S.

British Launderers' Research Association, The Laboratory, Hill View Gardens, Hendon, London, N.W.4. *Tel.:* Hendon 6111. Director, F. C. Harwood.

British Leather Manufacturers' Research Association, 8 St. Thomas' Street, London, S.E.1. *Tel.:* Hop 0175. Laboratories, 1 Nelson Square, London, S.E.1. *Tel.:* Waterloo 4432. Director, Dr. H. Phillips.

Linen Industry Research Association, Research Institute, Lambeg, Lisburn, Co. Antrim, N. Ireland. *Tel.:* Lisburn 2255. Director, Dr. A. J. Turner.

British Non-ferrous Metals Research Association, Euston Street, London, N.W.1. *Tel.:* Euston 3372. Director, G. L. Bailey.

Research Association of British Paint, Colour and Varnish Manufacturers, Paint Research Station, Waldegrave Road, Teddington, Middlesex. *Tel.:* Molesey 1063. Director, Dr. L. A. Jordan.

British Paper and Board Industry Research Association, 1 Buckingham Palace Gardens, London, S.W.1. *Tel.:* Sloane 2346. Director, Dr. N. R. Hood.

British Pottery Research Association, Federation House, Stoke-on-Trent. *Tel.:* 48631. Director of Laboratories, Dr. M. Francis, Beechfield, Queen's Road, Penkhull, Stoke-on-Trent. *Tel.:* 48741.

Printing and Allied Trades Research Association, Charterhouse Chambers, Charterhouse Square, London, E.C.1. *Tel.:* Clerkenwell 8115. Director, Dr. G. Riddell.

British Refractories Research Association, Drayton House, 30 Gordon Street, London, W.C.1. *Tel.:* Euston 2568. Director, A. T. Green. Laboratories, The Mellor Laboratories, Shelton, Stoke-on-Trent.

Research Association of British Rubber Manufacturers, 105 Lansdowne Road, Croydon, Surrey. *Tel.:* Croydon 6105. Director, Dr. J. R. Scott.

British Scientific Instrument Research Association, 26 Russell Square, London, W.C.1. *Tel.*: Museum 2656. Director, A. J. Philpot.

Scottish Shale Oil Scientific and Industrial Research Association, 53 Bothwell Street, Glasgow. Secretary, H. J. Conacher.

British Shipbuilding Research Association, 5 Chesterfield Gardens, Curzon Street, London, W.1. *Tel.:* Grosvenor 8891. Director, Dr. S. L. Smith.

British Welding Research Association, 29 Park Crescent, London, W.1. *Tel.:* Welbeck 7485. Director, Dr. H. G. Taylor.

Wool Industries Research Association, Torridon, Headingley, Leeds, 6. *Tel.:* Leeds 51047. Director, B. H. Wilsdon.

British Baking Industries Research Association, Chorleywood Lodge, Chorley Wood, Herts. *Tel.:* Chorleywood 900. Director, Dr. J. B. M. Coppock.

MUSEUMS.

Museums Association, Chaucer House, Malet Place, London, W.C.1. *Tel.:* Euston 1422. Maintains an index of the principal museums in Britain, with their specialist features. A list of London museums is available from the Ministry of Education, External Relations Branch, Belgrave Square, London, W.1. *Tel.:* Sloane 4522.

Museums generally. These include:

Geffrye Museum, Kingsland Road, London, E.2. *Tel.:* Bishopsgate 2554. Curator, Mrs. Harrison; period rooms.

Horniman Museum, Forest Hill, London, S.E.23. *Tel.:* Forest Hill 2339. Curator, Dr. O. W. Samson; sections on measurement of time, musical instruments, development of transport, weapons, locomotion in animals.

National Maritime Museum, Greenwich, London, S.E.10. *Tel.:* Greenwich 2175. Director, F. G. Carr; scale models of ships, arctic relics, early navigational instruments, and a library of books, maps and charts.

REFERENCE SECTION

REFERENCE SECTION

THE INFORMATION in the following pages is presented with as much uniformity as can be attained in a first book of reference of an international kind, where standards and concepts can and do vary so much from nation to nation. Those countries recorded as "No information" are those from which replies to enquiries have not been received up to the time of going to press; where "None" is recorded, this is based on information received from official or other responsible sources.

Any notification of amendments or additions would be welcome, and, while every care has been taken to ensure the correctness of the information given, the publishers would be grateful to receive notification of any errors, and of any subsequent new films and new organisations, etc., to be included under the appropriate headings in forthcoming editions.

The following abbreviations have been used in relation to films: mm., millimetres; ft., feet; m., metres; min., minutes; C., colour; M., monochrome; Sd., sound; St., silent; F., free loan; O., occasional loan; R., rental charges; S., available for sale.

The following contain accounts of cultural cinematography in particular countries:

INTERNATIONAL.

UNESCO: (1947) *Report of the Commission on Technical Needs in Press, Radio, Film.* Paris. 10*s.*

H.M.S.O.: (1936) *Convention for Facilitating the International Circulation of Films of an Educational Character.* Treaty Series No. 6. Cmnd 5155. London. 4*d.*

NATIONAL.

Czechoslovakia.

Brichta, J. H.: (in preparation) *The Film in Czechoslovakia.* Falcon Press, National Cinema Series. Editor, Roger Manvell. London.

Ministry of Information: (1947) *The Czechoslovak Nationalised Film Industry.* Prague. Free.

Vivié, J.: (1946) *Organisation technique de l'industrie cinématographique tchécoslovaque.* Bull. off. Comm. sup. techn. Ciné, *1*, 112–19. Ex. Sciences et Industries Photographiques, 2e sér., t, *18*, *4*, p. 114–15.

Germany.

H. H. Wollenberg: (in preparation) *The Film in Germany.* Falcon Press, National Cinema Series. Editor, Roger Manvell. London.

U.S.S.R.

Abolnik, Olga: (1946) *Scientific Films in the Soviet Union.* Anglo-Soviet Journal, 7, *3*, 33–7. London.

Dickinson, T., and de la Roche, C.: (in preparation) *The Film in Soviet Russia.* Falcon Press, National Cinema Series. Editor, Roger Manvell. London.

de la Roche, C.: (1948) "The Soviet Cinema and Science", *Penguin Film Review*, No. 5. London.

UNITED NATIONS, *Department of Public Information, Film and Visual Division*, Lake Success, New York. *Tel.:* Fieldstone 7–1100; *Cables*: Unations, New York. Assistant Secretary-General for Public Information: Benjamin Cohen. Director of Department of Public Information: Tor Gjesdal. Director of Films and Visual Information Division: Jean Bénoit-Lévy. Chief of Film and Television section: William Wells. Chief of Visual Information Section: Jan Juta.

The Films and Visual Information Division is charged with the responsibility for disseminating information about the United Nations through all the visual media including films, film strips, photographs and graphic material (posters, charts, exhibits, etc.).

The Division is organised in two sections, the Films and Television Section and the Visual Information Section. The Films and Television Section is responsible for the production of films and film strips either through its own resources or those of government film organisations or commercial film companies in the Member nations. It is also responsible for arranging distribution in the Member countries for these films and film strips. Both these activities are being undertaken with the assistance of National Film Committees for the United Nations in the Member countries. These committees which are being set up in the Member countries are voluntary organisations representing film production, distribution and exhibition. Another function of this section is to arrange

for newsreel and television coverage of United Nations activities and for the use of film material about the United Nations in the newsreels of the world.

For 1948 this section has undertaken the production of twelve films under its direct supervision but with each film being produced in a different Member nation. In addition a number of films of United Nations subjects have been undertaken by private or governmental organisations with the co-operation of the Division. In order to encourage and facilitate such free offerings, services are being developed, including a film footage library of United Nations material, a film catalogue listing completed films on subjects of interest to the United Nations and a periodical newsletter containing information on international film developments of value to film producers, distributors and users in the Member countries. The newsletter is aimed at Editors of film magazines and film organisation publications rather than to individuals. A programme of twelve film strips was approved for 1947. Two are now ready, dealing with the work of the United Nations Secretariat and the Economic and Social Council.

The Visual Information Section designs posters, charts, photospreads and other graphic materials for distribution to educational systems, public organisations and other organised groups in the Member countries. This section also designs loan exhibits as another means of disseminating information about the United Nations, its activities and the problems with which it deals. These materials are printed in the official languages with a view to reaching the widest possible audience.

The Visual Information Section is also responsible for the taking of official United Nations photographs, for their distribution in the press and publications of the world and for arranging coverage of the United Nations photographs by press and magazine photographers. Twelve hundred prints of United Nations photographs are regularly distributed each week with a large additional volume sent out in response to specific requests.

UNITED NATIONS FILM BOARD. Lake Success, New York. *Tel.:* Fieldstone 7-1100. Executive Director: J. Bénoit-Lévy.

The Charter members of the United Nations Film Board are: UN (Department of Public Information), UNESCO, (United Nations Educational, Scientific and Cultural Organisation), FAO (Food and Agriculture Organisation) and ILO (International Labour Organisation), but the following Specialised Agencies will participate until such time as they are officially brought into relationship with the United Nations and will be in a position

formally to join the Board: WHO (World Health Organisation), ICAO (International Civil Aviation Organisation), IRO (International Refugee Organisation), ITO (International Trade Organisation), Bank (International Bank for reconstruction and development) and Fund (International Monetary Fund).

The purposes of the United Nations Film Board are:

(1) To co-ordinate the activities of the United Nations and of the Specialised Agencies in the field of information and education by means of films and other visual media.

(2) To stimulate and, through its Executive office in accordance with the plans of its members, direct the production, distribution and use of films, and other visual media which shall serve the purposes of the United Nations and of the Specialised Agencies.

Films: 11 documentaries in preparation, including WORLD DELINQUENCY; already completed, FIRST STEPS, physical therapy for crippled children, which received Academy Award for 1947, and is distributed by Film Program Services, 1193, Avenue of the Americas, New York; HUNGRY MINDS.

Filmstrips: THE NON-SELF-GOVERNING TERRITORIES; GENOCIDE; THE PREAMBLE TO THE U.N. CHARTER.

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANISATION, UNESCO House, Avenue Kléber, Paris, 16e. *Tel.:* KLÉBER 52-00; *Cables*: Unesco-Paris. Director of Mass Communications: J. Grierson. Head of Film Section: W. Farr.

The purpose of the Organisation is to contribute to peace and security by promoting collaboration among the nations through education, science and culture in order to further universal respect for justice, for the rule of law and for human rights and fundamental freedoms which are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations.

To realise this purpose the Film Section of the Mass Communication Division of UNESCO will:

(1) Collaborate in the work of advancing the mutual knowledge and understanding of peoples through all media of visual information, and to that end recommend such international agreements as may be necessary to promote the free flow of ideas within these media;

(2) give fresh impulse to popular education and to the spread of culture:

(*a*) by collaborating with Members at their request, in the development of visual education and information services the world over;

(*b*) by suggesting visual education methods best suited to prepare the children of the world for the responsibilities of freedom;

(3) maintain, increase and diffuse knowledge:

(*a*) by assuring the conservation and protection of the world's inheritance of films, and, through films, of books, works of art, and monuments of history and science;

(*b*) by encouraging co-operation among the nations in all branches of intellectual activity, including the international exchange of films and other visual media; of persons and of publications;

(*c*) by initiating methods of international co-operation calculated to give the people of all countries access to the visual information materials produced by any of them.

The workaday pattern of the Film Section therefore involves:

(1) The development of national film-making groups, and the use of films for educational, scientific and cultural purposes in all countries;

(2) the exchange of film-making and film-using personnel between countries;

(3) the production, distribution and use of films related to UNESCO's purposes through national groups of all kinds;

(4) the international exchange of film information, and of information on films between countries.

The priority subjects for the production of films and for the exchange of information during the year 1948, are as follows: International Understanding; Fundamental Education; Popularisation of Science; Health; Medicine; Agriculture; Town and Country Planning; Popularisation of the Arts; the Use of Films by Libraries and Museums, by professional and technical organisations, by industries, by film societies and by all other specialised societies and groups.

INTERNATIONAL SCIENTIFIC FILM ASSOCIATION.

President: Jean Korngold (Poland), 3 rue du Colisée, Paris, 8e.

Vice-Presidents: J. Maddison (Great Britain), R. Pinto (Brazil).

Secretary: Jean Painlevé (France), 292 rue St. Martin, Paris. *Tel.:* TURBIGO 64–40.

Treasurer: E. J. Sallaz (Switzerland), 18 Place Cornavin, Geneva. *Tel.:* 2-6152.

The Association was formed in 1947 under the aegis of the Scientific Film Association, London, and the Institute of Scientific Cinematography, Paris. In addition to the officers named above, there are two Vice-presidents, and a Council of representatives from Australia, Austria, Belgium, Canada, Czechoslovakia, Malaya and Mexico.

It will be supported financially by subscriptions from Member organisations; each country represented will have one vote.

The Association was established in the belief that international co-operation in the field of science must contribute increasingly to the maintenance of peace between the nations, and to the well-being of mankind, and that in such co-operation, the cinema has a major role to fill. The members of the Association are persuaded that all those methods by which cinematography can assist in the increase of human welfare through the application and development of science should be more earnestly and more widely pursued.

The aims of the Association are to promote the use of the scientific films and related material throughout the world and to encourage the international use of films, film research workers, technicians, and users of scientific films. It will collate information from all countries on the production and use of such films, and on technical equipment. It will also encourage the formation of National Scientific Film Associations, the adoption of a standard international system of documentation and appraisal, and the publication of lists and critical catalogues of scientific films.

The inaugural meeting was held in Paris in October 1947; the next Assembly will be held in London in 1948.

AFGHANISTAN

(1) OFFICIAL ORGANISATIONS.

General Directorate of Publications, Kabul.

No scientific films made so far; a programme of documentary films has been planned for the forthcoming years.

ARGENTINA

(1) OFFICIAL ORGANISATIONS.

The formation of a Government Film Unit has been under discussion, but it has not as yet been formed.

(3) FILM MAKERS.

Guaranteed Pictures de la Argentina, Buenos Aires.

A new producing and distributing company which has bought 1,000 16 mm. projectors, and which plans production in 1948.

AUSTRALIA

(1) OFFICIAL ORGANISATIONS.

Australian National Film Board, Canberra. Producer-in-chief, S. Hawes.

Set up by the Commonwealth Government in May 1945, to make instructional and informational films for Australia, and for information overseas; also to distribute such films, and to acquire films from other countries for use in Australia. The production programme is handled for the Board by the Film Division of the Department of Information, and the Commonwealth National Film Library.

List: some 40 titles have been completed, all 16 mm., St.; this includes some 20 scientific topics, for example:

NATIVE EARTH, made for the Department of External Territories, describes restoration of Australian administration in New Guinea. 17 min., M. BACK IN CIRCULATION, rehabilitation of ex-Service men, 10 min., M.; JOURNEY OF A NATION, standardisation of railway gauges, 10 min., M.; MAKERS OF WINE, the Australian wine industry, 20 min., M.; BUILDING A BRICK HOUSE, an instructional film, 19 min., M.; BEE-KEEPING ON THE MOVE, mobile bee-keeping in Australia, 10 min., M.

The Board's future programme includes a series of classroom films, industrial films, and on subjects such as Australian fauna and flora.

Australian Wool Board, Canberra.

Maintains a Film Unit and a Film Library, and lends films to a variety of official and technical organisations. The films are of two kinds: those for instruction on sheep diseases and sheep husbandry, and those for information on woollen fabrics and fashions.

Commonwealth National Library, Canberra. Librarian, K. Binns.

The library distributes the above films; it is actively interested in scientific films as such, and, in conjunction with the Australian and New Zealand Association for the Advancement of Science, is considering setting up a sub-committee to investigate the question of establishing Scientific Film Associations in the several States.

Commonwealth Council for Scientific and Industrial Research, Canberra.

Recent approval for establishment of a film unit to make scientific films based on its current researches; in 1947 its State Committee screened a film depicting primary industry activities.

State Research Station, Glenfield, New South Wales.

Film on TECHNIQUE OF ARTIFICIAL INSEMINATION.

Victorian Department of Agriculture, Melbourne, C.2.

Films provided for appropriate audiences, together with projector and operator, without charge.

Victorian County Roads Board. Melbourne.

Has made a film on METHODS OF ROAD MAKING, including surveying and clearing the trail.

(2) LEARNED AND PROFESSIONAL BODIES.

Film Centre, Canberra (1940). 350 members.

New South Wales Committee in Postgraduate Medicine, Sydney.

Maintains a library of at present 50 films, in charge of a librarian; a pre-view theatre, and is interested in production.

University of Adelaide, Department of Pharmacy.

THE DISPENSING OF PILLS; PRODUCTION OF OLIVE OIL.

(3) FILM MAKERS.

Caltex. Ltd. HARVEST GOLD, a film on various aspects of cultivation.

Collins Film Corporation. Secretary, F. B. Denton, 397 Little Collins Street, Melbourne. Founded 1947.

The first film is planned on the life and work of William Farrer in the production of wheat resistant to rust disease.

Rubery, Owen and Kemsley, Ltd.

Colour film on the Rubery-Owen SEMI-PREFABRICATED HOUSE.

Gutteridge, Dr. E., Heidelberg Hospital, Melbourne.

OPERATION ON THE EAR-DRUM. C.

(5) PERSONAL DIRECTORY.

Stout, Professor A. K., Department of Moral Philosophy, University, Sydney, lately Chairman of National Film Board.

(6) FILMS.

PHYSICAL EDUCATION IN WESTERN AUSTRALIAN SCHOOLS.

GETTING RID OF RATS.

THE COMMON COLD.

OPERATION FOR HYDATID OF THE LIVER, made by the Alfred Hospital, Melbourne, for Johnson (*Aspro*) Proprietary, 16 mm., Sd., C., 14 min.

AUSTRIA

(1) OFFICIAL ORGANISATIONS.

Ministry of Education, Central Office for Educational Film (Staatliche Hauptstelle fuer den Bildungsfilm), Vienna. Director, Prof. Dr. A. Huebel.

Encourages use, distribution and exhibition of educational films. Every school child contributed 80 Austrian gröschen per annum.

County Offices for Distribution (Landesbildstellen).

Five offices distribute films of the Central Office; at Vienna, Graz, Linz, Innsbruck and Klagenfurt.

Regional Offices for Distribution (Bezirkbildstellen).

Eighty-five offices distribute films free to teachers at all educational levels; since the war the films so distributed have been subjected to Allied "screening".

(5) PERSONAL DIRECTORY.

Storch, Professor Otto, University, Vienna. Films in biology and cinémicrography.

BELGIUM

(1) OFFICIAL ORGANISATIONS.

Ministry of Education, Cinema Service (1946).

This section of the Ministry of Education proposes to develop the use of films and film strip; a production survey is in progress. Since the destruction by fire of their collection of 5,000 reels and transparencies some years ago, the Ministry contemplates making a collection of films for use in science at University level.

Institut National de Cinématographie Scientifique, Palais des Beaux-Arts, 2, rue Ravenstein, Brussels.

Engaged on making a census of films in science; thereafter, a selection will be made to establish a library for use in Belgium and overseas. Its resources are available to industrial or educational organisations interested in the production of popular or technical scientific films.

(5) PERSONAL DIRECTORY.

Conard, J., Brugman Hospital, Brussels. Appointed as cinematographer for making films of scientific interest, including the following:

TUSSILAGO FARFARA (COLTSFOOT), development of the capitula and movement of the peduncles in flowering and fruiting stages.

LIBELLULA (DRAGON-FLY), stages in its metamorphosis.

Wyns, M., Faculty of Medicine, St. Pierre Hospital, Brussels. Has made several scientific documentaries.

In addition, the following produce scientific films for use in their own lectures: M. Fauville, University of Louvain, M. Fala, University of Liège, Father Garmyn and M. Dhanis, University, Brussels. The Sanatorium at La Hulpe has active interest in medical cinematography.

BOLIVIA

None.

BRAZIL

(1) OFFICIAL ORGANISATIONS.

National Institute of Educational Cinema (Instituto Nacional de Cinema Educativo, Ministério da Educação e Saúde), Praça da República, 141A Rio de Janeiro. Director, Pedro Gouvéa Filho.

Founded 1938 by Dr. Roquete Pinto, the I.N.C.E. includes among its aims the production of scientific films, and facilitates freely, every co-operation with scientists' organisations interested in scientific film production, without exercising control over their activities.

Scientific films listed on the production side of the Institute's activities include:

APPENDECTOMY (APENDICETOMIA), a technical demonstration by Prof. Mauricio Gudin, St., 16 mm., 134 min.

GASTRECTOMY (GASTRECTOMIA), a technical demonstration by Dr. Gudin, 16 mm., C.

CULTURE OF MYOCARDIC TISSUE (MIOCARDIO EM CULTURA), under the scientific supervision of Dr. Carlos Chagas.

GENERAL PHYSIOLOGY (FIZIOLOGIA GERAL), experimental epilepsy by cooling the spinal cord in the frog; supervised by Prof. Ozorio de Almeida.

ELECTRICAL PROPERTIES OF THE PURAQUÊ, GYMNOTUS ELECTRICUS (PROPRIEDAS ELECTRICAS DO PURAQUÊ), experiments by Prof. Carlos Chagas.

(5) PERSONAL DIRECTORY.

Abreu. Dr. Manoel de.

Almeida, Prof. Miguel Osorio de, Instituto Oswaldo Cruz, Rio de Janeiro.

Aragão, Prof. Beaurepaire de, Instituto Oswaldo Cruz, P.O. Box 926, Rio de Janeiro.

Batista, Prof. Raul, Rio de Janeiro.

Baiocchi, Dr., Hospital Moncorvo Filho.

Campos, Dr. Oswaldo Pinheiro, Hospital Jesús, Rua Oito de Dezembro, Rio de Janeiro.

Campos, Prof. Sousa, Faculdade de Medecina, Universidade de Sao Paulo, Sao Paulo.

Chagas, Prof. Carlos, Faculdade de Medecina, Av. Pasteur, Rio de Janeiro.

Gudin, Prof. Mauricio.

Lima, Prof. Ermiro, Ed. Metropolitano, 12° andar rua Alvaro Alvim, 31 Rio de Janeiro.

Pereira, Prof. Jaime, Faculdade de Medecina, Universidade de Sao Paulo, Sao Paulo.

Pinto, Dr. Roquete, Av. Beira Mar, 406 Apt° 504 Rio de Janeiro.

(6) FILMS.

MORPHOGENESIS OF THE BACTERIA (MORFOGÊNESE DAS BACTERIAS), a documentation of studies and researches by Prof. Cardoso Fontes. 16 mm., 261 min.

SURGICAL METHODS OF PROFESSOR GUDIN (MÉTODO OPERATÓRIO DO PROF. GUDIN), Sd. (Portuguese, French and English).

EVOLUTION OF A FISH (EVOLUÇAO DE UN PEIXE), scientific supervision by Dr. Ihering. St.

FLUOROGRAFIA COLETIVA.

ELECTRICAL CONVULSOTHERAPEUTICS (CONVULSOTERAPIA ELECTRICA).

PREPARATION OF YELLOW FEVER VACCINE (PREPARO DA VACINA CONTRA A FEBRE AMARELA).

ESQUISTOSOMOSE DE MANSONI, schistomose, evolution of the parasite, pathological anatomy, prophylaxis and treatment.

BULGARIA

No information.

BURMA

No scientific film activity.

CANADA

(1) OFFICIAL ORGANISATIONS.

National Film Board of Canada, Ottawa, Ontario.

An agency of the Canadian Government, responsible for interpreting visually Canada's life and culture, her social problems, her national resources and industries, and her achievements in art, science, research and medicine.

Production.—In line with her vigorous film production activities in other fields, Canada has a number of films on scientific subjects to her credit. Most of these, whether sponsored privately or by the Government, present the public relations aspect of scientific or engineering subjects, such as:

FISHING PARTNERS (1945), deals with the Fisheries Research Board, 16 and 35 mm., 2 reels, M., Sd.

LET'S LOOK AT WATER (1947), deals with urban purification, 16 mm., 2 reels, and 35 mm., Sd.

There are also several scientific films designed primarily for specialised audiences, such as:

VEGETABLE INSECTS (1946), produced by the National Film Board with the co-operation of the Entomology Division of the Dominion Department of Agriculture, 16 mm., 2 reels, C., Sd.

THE WARBLE FLY AND ITS CONTROL (1945), 16 mm., 2 reels, C., Sd.

FROM GOLD ORE TO BULLION (1943), 16 mm. and 35 mm., 3 reels.

SECONDARY SHOCK (1943), produced by the National Film Board for, and with the co-operation of, the medical branches of the Department of National Defence, 16 mm., 3 reels, C.

STUDIES OF BATTLE CASUALTIES (1944–6), produced jointly by the Royal Canadian Army Medical Corps and the National Film Board. 16 mm., 3 reels, C., Sd.

CIVILIAN EPIDEMICS—NAPLES (1944). As foregoing, 1—2 reels.

A LETTER FROM ROSMERE (1947), deals with mosquito control; produced by Canadian Industries Ltd., with its own production facilities, 16 mm., 1 reel.

MENTAL MECHANISMS SERIES: "THE FEELING OF REJECTION—ITS DEVELOPMENT AND GROWTH" (1947). 35 mm., and 16 mm., 2 reels.

A FEELING OF HOSTILITY (1948), treatment of hostility between mother and adolescent daughter, 16 mm., Sd., F.

Other popular scientific titles include:

GREAT CANADIAN SHIELD (1945), Geology, 16 mm., C., 1 reel.

SALT FROM THE EARTH (1944), Salt Mining, 35 and 16 mm., 1 reel.

CERTIFIED FOR SEED (1945), Agriculture, 16 mm., C., 1 reel.

GOLD FROM GRAVELS (1937), Gold Mining; produced by the former Canadian Government Motion Picture Bureau, 35 and 16 mm., 3 reels.

BATTLE OF BRAINS (1941), Wartime Research, 35 and 16 mm., 1 reel. UNIVERSITIES AT WAR (1944), Scientific Education, 35 and 16 mm., 1 reel. INSIDE THE ATOM (1948).

YOUR MORNING MILK (1947), Pasteurisation, 35 and 16 mm., 2 reels.

VITAMIN WISE (1943), Nutrition, 35 and 16 mm., 2 reels.

WHAT MAKES US GROW (1943), Nutrition, 35 and 16 mm., 2 reels.

VERY DANGEROUS (1945), Venereal Diseases, male version, produced by Crawley Films for the National Film Board, 16 mm., C., 2 reels.

SIXTEEN TO TWENTY-SIX (1945), Venereal Diseases, female version, produced by Crawley Films for National Film Board, 16 mm., C.

Distribution.—The National Film Board has, since the autumn of 1944, surveyed the fields of medical, biological and health education films. As a result of this survey, the Board has secured the formation of a *National Medical Film Library*, containing in 1947 approximately 150 medical and biological titles which have been recommended by appropriate groups from a medical film appraisal panel set up in the major medical teaching centres in Canada. In addition, a *National Health Film Library* has been built up, consisting of a similar number of health educational films recommended by a film reviewing committee at the Department of National Health and Welfare.

The survey and compilation of these libraries has been carried out with the full co-operation and assistance of the Department of National Health and Welfare, and of the Canadian medical schools. The two libraries have been made available to appropriate groups through the National Film Society, who are distributing them on behalf of the Canadian Government.

The *Regional Offices* of the National Film Board are as follows:

British Columbia, 535 West Georgia St., Vancouver.
Alberta, Extension Dept., University, Edmonton.
Saskatchewan, Dept. of Education, Regina.
Ontario, 86 Bloor St. West, Toronto.
New Brunswick, Provincial Normal School, Fredericton.
Nova Scotia, Dept. of Education, Halifax.
Prince Edward Island, Prince of Wales College, Charlottetown.
Manitoba, 205 McArthur Building, Winnipeg.
Quebec, 305 Confederation Building, Montreal.
Film Strip Unit, 196 Sparks St., Ottawa.

Producer, Forbes Helam; unit of three artists, script writer and titler. Filmstrips are 35 mm., M. or C., single frame,

issued with written script (English), or sound recordings, S. Titles include:

ABC OF GARDENING, 51 frames, M., Sd., French or English recording.

ACUTE RESPIRATORY DISEASE, 21 frames, M., St.

CANADA'S RESEARCH FACILITIES, 86 frames, M., St.

CANNING STEP BY STEP, 43 frames, M., St., French or English.

CONTROL OF RESPIRATORY DISEASES, 50 frames, M., St.

FEMININE HYGIENE, 39 frames, C., St.

FREEZING FRUITS AND VEGETABLES, 40 frames, M., St.

FROM THE GROUND UP, 56 frames, M., Sd.

GREAT LAKES SHIPPING, 50 frames, M., St., French or English.

ISOLATION TECHNIQUE, 54 frames, M., St.

NINE TO GET READY, 53 frames, C., Sd.

ORPHAN WILLIE, 66 frames, M., Sd.

RURAL SCHOOL LUNCHES, 56 frames, M., St., French or English.

Equipment and Technique.—Specialised filming techniques are being developed in Canada at the present time. The National Film Board is doing extensive micro-filming for other Government departments, and plans are laid for ciné-photomicrography, time-lapse photography and high-speed photography, and initial experiments in these fields have been carried out. The National Research Council of Canada is developing a high-speed camera of revolutionary design. In a working model, speeds of 60,000 to 80,000 frames per second have been obtained, and an improved model is expected to reach speeds of 200,000 frames per second.

Catalogues.—(i) General, and (ii) Medical and Biological, 1947.

(2) LEARNED AND PROFESSIONAL BODIES.

Canadian Scientific Film Association, 172 Wellington St., Ottawa, Ontario.

The only organisation in Canada dealing specifically and solely with scientific films; formed in September 1946 on the lines of the Scientific Film Association in Britain.

The CSFA is now engaged in bringing together all those interested in production, and, more especially, the utilisation of scientific films; to encourage and aid in the widest possible distribution and exhibition of scientific films and other audio and visual aids in Canada; to stimulate the production of Canadian scientific films in order to utilise fully the possibilities inherent in a combination of Canada's excellent tradition in documentary films and her important position in scientific research.

Catalogue.—1946, and *Supplements Nos. 1 and 2.*

National Film Society of Canada, 172 Wellington Street, Ottawa.

A non-profit educational organisation having for its main object the extended use of educational and cultural films in Canada.

Queen's University, Kingston, Ontario.

The Department of Medicine uses films, and has made several, including:

FAMILY OUTBREAK OF POISONING BY ARSENATE OF LEAD; PALPATION OF THE ABDOMEN IN PREGNANCY.

University of Toronto, Toronto.

The Department of Medicine has made several films, including:

NEW LIMBS FOR OLD; SYMES AMPUTATION AND LATE RESULTS; TREATMENT AND REHABILITATION IN PARAPLEGIA; GALLIE OPERATION FOR RECURRENT DISLOCATION OF THE SHOULDER.

(3) FILM MAKERS.

Associated Screen News, Ltd., 2000 Northcliffe Rd., Montreal.

Has made sponsored films for National Film Board, such as LIVESTOCK (1947), for National Film Board and Department of Trade and Commerce.

Atlas Steel Co., Canada (Harvey and Russett, Ltd.).

A VISION FULFILLED, a description of steel production and laboratory procedure.

Bruck Silk Mills, Cowansville, Quebec.

THE FABRIC OF OUR STORY, an account of rayon processing, C., Sd., 30 min.

Canadian General Electric Co., Toronto.

Catalogue 4172D lists over 50 films, all 16 mm., made on a non-commercial basis, for science students of universities and secondary schools, and for industrial, radio and civil engineers; titles include: PRINCIPLES OF ELECTRICITY, C.; EXPLORING WITH X-RAYS; ATOMIC HYDROGEN ARC WELDING; THIS IS RESISTANCE WELDING; BRAZING CARBIDE TOOLS; EXCURSIONS IN SCIENCE; WORLD OF PAPER; JET PROPULSION, shows principles of air intake, compression and mixing with fuel, and expulsion. All F. to institutions.

Canadian Industries Ltd., Nylon Division, Toronto.

NYLON HIGHLIGHTS, applications and uses of synthetic yarn, 16 mm., Sd. C.

Crawley Films, 19 Fairmount Avenue, Ottawa, Ontario.

Has made sponsored films, such as three films on CANADIAN ROCKIES, for Department of Mines and Resources; KNOW YOUR BABY, 16 mm., C., for Canadian National Film Board.

Davis and Geck, Ltd.

COMPLETE LACERATION OF THE PERINEUM; VAGINAL HYSTERECTOMY; ABDOMINAL HYSTERECTOMY.

Paasche Airbrush (Canada) Ltd., 864 Pape Avenue, Toronto.

THE SERVICE ANGLE, a sound slide-film (filmstrip), 30 min., showing details of the servicing of air-brushes.

Shaumigan Chemicals, Ltd., Montreal.

Films on the Gyrosin compass and the action of cyclone combustion.

Shelley Films, 91 Yonge St., Toronto, Ontario.

Imperial Oil Co., Ltd. SEARCH UNENDING (1946). Deals with oil prospecting.

RIVER OF PAPER (1946), for the Pulp and Paper Institute.

Williams and Wilson, Ltd. (E. N. Kingsland, 544 Inspector St., Montreal; T. W. Simpson, 11 Front St. East, Toronto).

HEAT-TREATING HINTS, steel being quenched in brine, various methods and protective techniques, Pt. I, 48 min., Pt. II, 38 min., 16 mm., Sd., C., F. in Canada.

Industrial Film Council, Montreal (1947).

Executive Director, J. M. Clement; Secretary, R. M. Morris.

Formed under the approval of the National Film Board of Canada, to supply sound and slide films, projection research and library service to industry; ninety corporate members, including Canadian Industries, Ltd., Imperial Tobacco Co., Aluminium Co., Canadian Pacific Railway, National Breweries, and Dupuis Frères.

CEYLON

No information.

CHILE

(1) OFFICIAL ORGANISATIONS.

Ministry of the Interior, Section of Information and Culture, Santiago de Chile. H. Helfritz.

TIERRA DEL FUEGO, an ethnical film; NORTHERN CHILE; ANTARCTICA.

(2) LEARNED AND PROFESSIONAL BODIES.

Institute of Educational Cinematography (Instituto de Cinematografia Educativa), Arturo Prat 74, Santiago. Director, Miguel Avila. An institute of the University of Chile.

(5) PERSONAL DIRECTORY.

Lipschutz Dr., Faculdade de Medecina, Universidade, Santiago; has made films in colour on the ethnology of the inhabitants of Tierra del Fuego.

CHINA

(1) OFFICIAL ORGANISATIONS.

China Educational Film Corporation (Chung Kuo Chiao Yu Tien Chih Pien Tsang), Nanking. Director, Office of Audio-Visual Education, Tu Wei-Tao.

Formed recently by the Chinese Ministry of Education in the Social Education Department (Third Section); plans to develop audio-visual education in China, and in particular to produce films on educational, including scientific, topics.

As a first step, 15 films are planned.

University of Nanking, College of Science, Department of Educational Cinematography. Director, Professor M. C. Swen.

The College now offers a fully-organised two-year course in Film and Radio, based on a fifteen-year period of development.

In 1930–5, films for scientific teaching were introduced, beginning with Eastman Kodak films in English, later translated and edited by the staff of the Chemistry Department; Chinese films were put into production by 1936, under Mr. M. C. Swen.

In 1937 the entire college moved westward 1,500 miles to Szechuan; work under war conditions was greatly hampered, but from Chungking, as a base, films were made on THE SIKING CAVES, SALT WELLS, and MOUNT OMEI. By 1938, with the co-operation of the Ministry of Education, a two-year course in Film and Radio was offered by the College, first at Chungking, and later at Chengtu.

Since 1941, the Department has possessed sound as well as silent equipment, and has co-operated with other bodies such as the United Nations Picture News Office in extra-curricular film showings; it has now returned to its old quarters in Nanking, in an extended form, and renamed as the Audio-Visual Centre. Fellowships have been held by Mr. M. C. Swen in the United States, and by Mr. Hu Yu-chang in Britain.

In 1947 there were 104 students from fourteen departments taking film and radio courses; since 1942 the department has published *Film and Radio* in Chinese several times yearly.

Provincial College of Education, Kiangsu.

Maintains an audio-visual education department.

National College of Social Education, Soochow.

Audio-visual studies are made.

Provincial Education Department, Fukien.

Maintains a studio which has produced four documentary films.

(2) LEARNED AND PROFESSIONAL BODIES.

Nanking Film and Radio Workers' Forum.

Formed in 1946 as a centre for friendly fellowship in film matters, particularly technicalities. It meets fortnightly, usually at the University of Nanking, and is represented by organisations, including the Ministry of Education and its Film Production Unit, the China Film Studio of the Ministry of Defence, etc.

The Forum has opportunity to make representations about current legislation. For example, it requested that educational films should be imported free from quota restrictions and duty; this was granted. The ban on photographic supplies was also lifted.

(3) FILM MAKERS.

Department of Educational Cinematography, University, Nanking.

Since 1935, about 100 titles in scientific and educational films, 16 mm., silent, have been produced. They are sub-titled in Chinese, chiefly monochrome; they include: Geography, 23 titles, Military Sciences 3, Industry 28, Natural Sciences 3, Agriculture 4, and Civics 5.

(4) DISTRIBUTORS.

See 1, 2 and 3 above.

(5) PERSONAL DIRECTORY.

Hu, Yu-Chang, Department of Educational Cinematography, University of Nanking; studied British film production under a British Council Fellowship, London, 1947–8, at the studios of Gaumont-British Instructional, Ltd.

Sun, Ming-Chin Professor, in charge of film work of Nanking College of Science during its period of evacuation to Chengtu.

Swen, Professor M. C., director, Audio-Visual Centre, College of Science, University of Nanking. Studied film production in the United States, under a Rockefeller Foundation grant, 1940–1; prior to the outbreak of war, undertook a ciné-photographic expedition to the northern provinces.

Tu, Wei-tuo, Director, Office of Audio-Visual Education, Ministry of Education, Nanking.

(6) FILMS.

SALT WELLS OF CHINA; MOUNT OMEI; TOTAL SOLAR ECLIPSE, deals with eclipse observed from Shanghai Observatory, made at Nanking University. It comprises 11 reels in monochrome, and 1 reel in colour (50 ft.) shown at the Cannes Film Festival, 1946.

The foregoing were made at Nanking University.

(8) PERIODICALS.

Film and Radio, a monthly periodical, produced by Nanking University, in Chinese, contains information from time to time about scientific films.

COLOMBIA

No information.

CUBA

No information.

CZECHOSLOVAKIA

(1) OFFICIAL ORGANISATIONS.

Czechoslovak State Film (Českosloslovenský statnífilm), Praha II, Jindřišská 34.

State Film Production, Non-Full Length Films (Státní výroba krátkých filmu), Praha II, Václavské máměstí 43.

Production of popular scientific and documentary films.

State Film Distribution (Státní rozdělovna filmu), Praha II, Národní třída 28.

Hire and sale of films inland.

Foreign Department, Czechoslovak State Film (Zahraniční oddělení Československého státního filmu), Praha II, Jindřišská 34.

Sale of films abroad.

Czechoslovak Film Institute (Československý filmový ústav), Praha II, Klimentská 4. *Tel.*: 623–10. Director, Ing. Ladislav Krivánek.

Production of educational, scientific and teaching films; research and scientific study of theoretical problems of the cinema; education of film technicians, promotion of film culture; museum; film library.

(2) LEARNED AND PROFESSIONAL BODIES.

Institute for the Scientific Film (Ústav pro vědecký film), Praha II, Na výtoni 9. Director, Dr. Ing. Zdeněk Holub.

Czechoslovak Society for Scientific Cinematography (Československá společnost pro vedĕckou kinematografii), Praha II, Viničná 7. Chairman, Prof. Dr. Viktorin Vojtěch; Secretary, Dr. Slaba.

Institute for Photochemistry and Scientific Photography (Ústav pro fotochemii a vedĕckou fotografii Karlovy University), Charles University. Praha II, Viničná 7. Director, Prof. Viktorin Vojtěch.

Institute for Scientific Photography and Cinematography, Benes University (Ústav pro vêdeckou fotografii a kinematografii Benešova Universita), Brno, Veveří. Director, Prof. Dr. Ing. Jaroslav Bouček.

(3) FILM MAKERS.

Dr. Ing. Zdeněk Holub, Professor of Scientific Cinematography, Institute for the Scientific Film, Prague II, Na Výtoni 9.

Docent J. Calábek, Institute for Plant Physiology, Masaryk University, Brno, Kotlářská ulice.

(4) DISTRIBUTORS.

State Film Distribution (Státní rozdělovna filmů), Prague I, Národní třída 28.

Czechoslovak Film Institute (Ceskoslovenský filmoý ústav), Prague II, Klimentská 4.

Institute for Films and Lantern Slides (Ústav pro film a diapositiv), Praha II, Havlíčkova 13. Director, Dr. F. Kysela.

(5) PERSONAL DIRECTORY.

Dr. J. Bouček; Ing. C. J. Brichta; Dr. Ing. Zdeněk Holub; Ing. L. Křivánek; Dr. F. Kysela; Dr. Slaba; Prof. Dr. J. Calábek; Prof. Dr. V. Vojtech.

(6) FILMS.

Medical.—Implantatio Coli Femoris in Caput; Luxatio coxae dex. Congenita; Progenia Mandibularis.

Scientific.—The Parabola; The Ellipse; The Hyperbola.

Popular Scientific.—The Silkworm; Life of the Bee; The Fight Against Tuberculosis; Carbide; Battle for Coal; Water Plants.

DENMARK

(1) OFFICIAL ORGANISATIONS.

State Film Library (Statens Filmcentral), Dahlerupsgade 1, Copenhagen V. *Tel.:* Central 16772. Director, Ebbe Niergaard.

Founded 1939, financed from the Government Film Fund; distributes educational, cultural and scientific films to schools and organisations at a low cost; twenty-eight local centres will soon be established.

Government Film Committee (Ministeriernes Filmudvag), Slotsholmsgade 10, Copenhagen, K. *Tel.:* Central 6438.

Production of documentary, educational and scientific films.

Danish Cultural Film Organisation (Dansk Kulturfilm), Dahlerupsgade 3, Copenhagen, K. *Tel.:* Central 16773.

Sponsors films made by commercial units.

(2) LEARNED AND PROFESSIONAL BODIES.

Zoophysiological Institute, Juliane Maries Vej 32, Copenhagen, O.

Royal Veterinary and Agricultural Academy (Den Kongelige Veterinaer-og Landbonojskole), Bülosvej 13, Copenhagen, V.

Chemical Laboratory, Polytechnic Academy (Den Polyteeniske Laereanstalts Kemiske Laboratorium), Östervolgade 10, Copenhagen, K.

(3) FILM MAKERS.

Ingolf Boisen, *Hagen Hasselbalch*, and *Axel Lerche*, of *Minerva Film A/S*, Toldbodgade 18, Copenhagen, K.

Soren Melson, Postbox 9, Borkerod.

(4) DISTRIBUTORS.

See *Statens Filmcentral* above.

Dental Surgeons' High School, Copenhagen.

SIMONS ORTHODENTIC DIAGNOSTIC (1938), 240 m.

IMMEDIATE FULL DENTURE CONSTRUCTION (1941), 16 mm., 600 m., by Dr. dent. surg. A. G. Lauritzen.

Minerva-Film (see above).

SURGERY OF THE EYE (Dr. Edmund); CATARACT (Prof. Ronne); SCABIES CURE (Ludvig Nielsen); OUR TEETH (Ludvig Nielsen); PLASTIC BREAST SURGERY (Prof. Foged); LUNG SURGERY (Dr. Husfeldt); BRONCHOGRAPHY (Queen Louise's Children's Hospital, Copenhagen).

(5) PERSONAL DIRECTORY.

Edmund, Dr. med. Carsten, Nörre Volgade 8, Copenhagen, K.

Fischer, Dr. med. Albert, Tagensvej 16, Copenhagen, N.

Made films in Germany before the war; possesses 3 films, 35 mm., showing (i) living animal tissue eells in fully developed organism, (ii) living tissue cells in an organism attaeked by eaneer, (iii) technique of growing of tissue (viviseetion).

Foged, Prof. Dr. med. Jens, Östergade 16, Copenhagen, K.

Husfeldt, Prof. Dr. med. Erik, Toldbodvej 5, Copenhagen, K.

Lauritzen, Dr. dent. surg. A. G. Vesterbrogade 57, Copenhagen, V.

Michelson, Science Editor Borge, Allers Etabl., Valby, Copenhagen O.

Rehberg, Prof. Dr. phil. Brandt, Juliane Maries Vej 34, Copenhagen.

Thomsen, Prof. Dr. phil. Mathias, Skt Kjeldsgade 14, Copenhagen V.

DOMINICAN REPUBLIC

No seientifie film activities as sueh have as yet been developed; however, eertain eultural and scientifie centres frequently show scientifie films from other countries.

ECUADOR

None.

EGYPT

(1) OFFICIAL ORGANISATIONS.

Ministry of Education, (Cinema Inspectorate, Cairo. Edaret Alcinama Bewazaret, Almaaref Alomoumiah).

Exhibition and distribution of 16 and 35 mm. sound and silent films; production of suitable films wherever possible.

People's University, Film Section (Kism Alcinama Belgamaah), Cairo.

Exhibition and distribution of 16 and 35 mm. sound and silent films.

Ministry of Public Health, Health Publicity Department (Kism Aldiayah Alsihyiah, Bewezaret Alsehhah), Sharia El-E Falaki, Bab-El-Luk, Cairo.

Production and exhibition of sanitary and hygiene films.

Ministry of Agriculture, Agricultural Museum (Almathaf Alziraee Bewezaret Alziraah), Dokki, Cairo.

Production and exhibition of 35 mm. agricultural films.

(2) LEARNED AND PROFESSIONAL BODIES.

The following bodies are interested in scientific films, chiefly for exhibition:

British Institutes in Cairo, seven in number.
Fouad I University, Cairo.
Forouk I University, Alexandria.
Ministry of Education; schools in Egypt, over 300.
Young Men's Christian Association, Cairo.
Young Women's Christian Association, Cairo.
Medical Clubs in Cairo.
Architects' Association Club, Cairo.
American University, Cairo.

(3) FILM MAKERS.

Ministry of Agriculture, Agricultural Museum, Dokki, Cairo.
Ministry of Education, Cinema Inspectorate, Cairo.
Ministry of Public Health, Publicity Department, Cairo.
Studio Misr, M. Armand Panigel, Sharia El-Hazem, Cairo.

(4) DISTRIBUTORS.

B.S.M.E., 6 Sharia Antikhana, Cairo (35 mm.).
The British Council, 32 Sharia Malika Farida, Cairo (16 mm.).
Cinema Inspectorate, Ministry of Education, Cairo (16 mm.).
J. Green and Co., 147 Sharia Emad-El-Din, Cairo.

(6) FILMS.

SUGAR, 35 mm., Sd., with Arabic commentary; distribution Studio Misr.

FINLAND

No information.

FRANCE

(1) OFFICIAL ORGANISATIONS.

Ministry of Agriculture, 45 rue de Varenne, Paris. Distributes 35-mm. silent films.

Ministry of Aviation, 35 rue St. Didier, Paris, 16e.

Ministry of Public Health, 66 Bd. St. Michel, Paris, 6.

Distribution of 100 films, including 35 and 16 mm. sound and silent.

Ministry of Youth, Art and Letters. Founded in 1946 the Centre National de la Cinématographie.

Centre National de la Cinématographie, Paris.

Distribution of non-commercial films; encouraging the development of non-commercial aspects of the cinematographic industry.

Institut des Hautes Etudes Cinématographiques. Director-General, M. Gerin.

A registered company, for professional training of technicians.

École Technique de Photo et du Cinéma (1926).

Provides a two-year course for training of technicians, cinema branch.

Musée Pedagogique (1920), Paris.

Maintains a library of about 400 films; propose to expand library to about 2,000 films.

(2) LEARNED AND PROFESSIONAL BODIES.

Fédération Nationale du Cinéma Educatif, 52 Bd. Beaumarchais, Paris, 11e.

Production and distribution of films to schools and other teaching organisations; film sessions held periodically.

Catalogue.—Général de Films, includes many scientific titles. The 1947 production programme included:

INVERSIONS (Mathematics); CAPILLARITY AND FLOTATION (LA CAPILLARITE ET LA FLOTTAISON, Physics); FERTILISATION IN GINGKO BILOBA (LA FECONDATION DU GINGKO, Botany).

Publications.—*Films et Documents*, monthly.

Institut de Cinématographie Scientifique, 292 rue St. Martin, Paris, 3e. *Tel.:* Turbigo 64–40. Director, J. Painlevé.

An organisation for the production of scientific films; research laboratory.

University Clubs.

In each University in France there exists at least one, and usually several societies, both private and public, interested in viewing films, including those on scientific topics.

Cercle Technique de l'Ecran, Salle 7e Villiers, 21 rue Legendre, Paris.

Fedération Française des Ciné-Clubs. 120,000 members.

(3) FILM MAKERS.

Nearly all Government Departments and commercial film producers make scientific films. The following are specialist film makers:

Artisans d'Art du Cinéma, 93 Avenue des Champs Elysées, Paris, 8e.

Films Jean Mineur, 95 Avenue des Champs Elysées, Paris, 8e.

Films Eclair, 12 rue Gaillon, Paris, 2e.

The following are industrial film makers:

Aluminium Française, 23 bis, rue de Balzac, Paris, 8e. Four films, 16 mm., Sd.

Building Centre, 28 Bd Raspail, Paris, 7e.

BATIR (Building), 35 and 16 mm.

Office Technique pour l'utilisation de l'acier.

MAGIE DU FER BLANC (1936), manufacture of tinplate, and its utilisation in the canning industry, Sd., St.

Rubber Institute, 42 rue Scheffer, Paris, 16e.

Three films, 35 and 16 mm., Sd.

(4) DISTRIBUTORS.

There are no centralised lending libraries; commercial and private companies distribute their own films.

(5) PERSONAL DIRECTORY.

Outstanding films have been made in the past by Dr. Gosset, Dr. Pauchet, Dr. Doyen, and Dr. de Martel, whose colour film on

brain surgery is considered to be a masterpiece. Scientific films are being made at present by:

Dr. J. Comandon, Laboratoire de Bellevue, Place Aristide Briand, Bellevue (S. et O.).

In conjunction with M. Pierre de Fonbrune, a remarkable series of films made on microbiology, illustrating micromanipulation techniques, made during the last two decades. All 35 mm. St., with sub-titles in French; they include:

TRYPANOSOMES DE LA NAGANA; PHAGOCYTOSE IN VITRO DES MICROBES PATHOGENES; AMOEBA VERRUCOSA; CHAMPIGNONS PREDATEURS DES NEMATODES DU SOL; MITOSE DE L'AMIBE; CARYOCINESE D'UNE CELLULE. About twenty films, from 100 m. to 400 m. in length.

Claoué, Dr., 12 Avenue Alphand, Paris, 16e.

Libel, M. Léopold, president, Section de Cinématographie, Société française de Photographie.

Lyot, M. Bernard, 9 bis, rue Boileau, Paris, 16e. Films in Astronomy.

Métain, M., 63 rue Jaques Dulud, Neuilly-sur-Seine. Films in Microcinematography.

Obaton, Dr., 6 rue Flatters, Paris, 5e. Films in Plant Biology.

Montel, M. Paul, Director, École Technique de Photographie et de Cinematographie.

Painlevé, M. Jean, 292 rue St. Martin, Paris, 3e.

Popular presentation of science. HIPPOCAMPUS; LE VAMPIRE.

Thevenard, Dr., 58 rue de Bourgogne, Paris, 7e.

(6) FILMS.

GREFFES DES NOYAUX D'AMIBES (TRANSPLANTATION OF NUCLEI OF AMOEBAE, Comandon and de Fonbrune); HIPPOCAMPUS (SEA HORSE, Painlevé); LE VAMPIRE (Painlevé), THE BATTLE OF HEAVY WATER, the part played by France in atomic research.

(7) BOOKS.

SARDOUL, G.: *L'Invention du Cinéma*, Edition Denoël, Paris, 1945.

Books are in preparation by Dr. Comandon, M. André Lang and M. Thevenard.

(8) PERIODICALS.

Occasional articles on scientific films in:

Catalogue Répertoire des Films en exploitation, Mme. J. Druhot, 13, rue Grange-Batchère, Paris, 9e. *Tel.:* Provence 58–35.

Films et Documents, Fédération Nationale du Cinéma Educatif, 10 rue Ducouédic, Paris, 14e. *Tel.:* Gob. 39–42. Monthly, 28 fr.50.

Le Film Français, weekly, 500 francs per annum.

Sciences et Industries Photographiques, 3 Boulevard Pasteur, Paris, 15e; scientific and technical aspects of photography and cinematography; founded 1921, monthly, 70 fr. Editor, L. P. Clerc.

La Revue du Cinéma.

La Technique Cinématographique, 122 Avenue de Wagram, Paris.

Filmologie, cinema treated as a social phenomenon. Director, M. G. Cohen-Séat, 93 Avenue des Champs Elysées, Paris.

GERMANY

(1) OFFICIAL ORGANISATIONS.

BRITISH ZONE

Control Commission for Germany (*BE*), Education Branch, Broadcasts and Teaching Aids sub-section, Hamburg 13, Rothenbaumchaussee 116, 63 H.Q., C.C.G., B.A.O.R. *Tel.:* 44–73, 59 Ext. 6.

Soon after the capitulation, teaching aids in schools were scheduled for re-establishment. The material, equipment and personnel of the former Reichsanstalt für Film und Bild was re-formed into the present Institut für Film (see below). G. Buckland Smith.

Institut für Film und Bild in Wissenschaft und Unterricht. Hamburg 13, Rothenbaumchaussee 116. Director, Fridolin Schmid.

The institute is supported entirely from State funds; its purpose is to promote the production and distribution of films, lantern slides and other teaching aids for use in schools, Universities, etc.

Höckelheim b. Northeim, Hannover. *Tel.:* Northeim 663. Director, Dr. Gotthard Wolf.

There is a separate department of the FWU at Höckelheim, near Göttingen, for the production of films for Universities and for research purposes. Research films have been made on topics such as:

WIRKUNGEN DES LABYRINTHES; STATOCYSTEN DES FLUSSKREBSES; REIZBEWEGUNGEN VON MIMOSA PUDICA.

High-speed cinematographic studies have also been made on subjects such as the mechanism of a threshing machine, the splintering of ordinary and of safety glass, in pursuance of research problems.

Prior to 1939, over 500 films on scientific and technical topics were made for Universities and Technical Colleges for research and record. They included:

Physical Culture, 17 titles; Physiology, human, 16; Pathology, 1; Hygiene and Bacteriology, 7; Pharmacology, 16; Psychiatry, 26; Surgery, 33; Gynaecology, 32; Ophthalmology, 15; Veterinary

Science, 20; Agriculture, 8; Astronomy, 1; Meteorology, 6; Geography, 9; Botany, 7; Zoology and its branches, 110; Physics, 17; Chemistry, 5; Mathematics, 6; Human Geography and Ethnology, 50; Technology, 34; Electrotechnics, 50; Metallurgy, 15.

Titles include: RÖNTGENKINEMATOGRAPHISCHE STUDIEN ÜBER DIE BEWEGUNG DES ELBOGENGELENKS, R. Janker (X-RAY STUDIES OF THE MOVEMENT OF THE ELBOW JOINT); MIKROKINEMATOGRAPHISCHE DARSTELLUNG DES BÖSARTIGEN WACHSTUM, Huzella (CINEMICROGRAPHIC STUDIES OF CANCEROUS GROWTH); DER BEWEGUNGSAPPARAT VON BAKTERIEN UND PROTOZOEN, Neumann (ORGANS OF MOVEMENT IN PROTOZOA AND BACTERIA); RÖNTGENTONFILM DER SPRACHE, Janker (X-RAY FILM OF SPEECH); HORMONWIRKUNGEN BEI HÖHEREN PFLANZEN, Kabiersch (EFFECT OF HORMONES ON HIGHER PLANTS).

(4) DISTRIBUTORS.

BRITISH ZONE

The production of films now having been resumed, the needs of users will soon be provided for. There are in existence six regional film libraries, and 193 local libraries. Most of the Universities and Colleges of university rank possess projection equipment and a small library of films, but they are not being fully used at present.

(6) FILMS.

THE HONEY BEE, for teaching biology to schools (F. 301) (FWU).

BROWNIAN MOVEMENT, partly in animated diagram (Höckelheim department of FWU).

(8) PERIODICALS.

Schule, Film und Funk (1948), a new periodical produced recently for teachers. It will contain material on scientific films. Schule, Film und Funk Verlag, Hammerbrookstrasse 93, Hamburg 1.

AMERICAN ZONE

Institut für den Unterrichtsfilm, Munich.

This institute is in existence, together with its regional and local film libraries. Since the capitulation, no new films have been put into production.

RUSSIAN ZONE

Zentrale Schulbildstelle, Berlin.

This is in existence, together with its regional and local film libraries. As far as is known, no new productions of instructional or of scientific films have been started since the capitulation.

GREAT BRITAIN

(1) OFFICIAL ORGANISATIONS.

(Films sponsored by Government Departments are distributed through the Central Film Library or the Offices of the Central Office of Information.)

Ministry of Agriculture and Fisheries, 55 Whitehall, London, S.W.1. *Tel.:* Whitehall 3400.

Birds of the Village, 35 mm., 18 min.; Diseases in Poultry, 35 mm., 16 min.; Parasitic Gastritis in Sheep, 35 mm., 18 min.

Admiralty, Whitehall, London, S.W.1. *Tel.:* Whitehall 9000.

Royal Navy Film Corporation, Royal Victoria Yard, London, S.E.8. *Tel.:* New Cross 0012.

Armament in Action, 35 mm., M., 33 min.; High-Angle Gunnery, 35 mm., 55 min.

British Council, 3 Hanover Street, London, W.1. *Tel.:* Mayfair 8484. Director, Films Department, Miss C. M. Middleton.

Prior to June 1946 the Film Department of the British Council was responsible for producing films covering a wide range of subjects dealing with the life, work and thought of the British people. Since the merger with the Films Division of the Central Office of Information in June 1946, the Council's Film Department continues to function as a part of the Council. It distributes films to British Council institutions overseas, and to British Council centres in the United Kingdom, for foreign audiences only. Films sponsored by the British Council are commissioned through the Central Office of Information.

Applications for loan of films for British audiences should be made to the Central Film Library (p. 131), or G.B.I. Library (p. 159); applications for loan of films overseas should be made to the British Council representative in the capital of the country concerned.

The following are scientific titles sponsored by the Council:

Transmission of Rotary Motion (1946), for junior technical school audiences, 12–16 years, simple shafts, gear, chain and belt drive, 11 min.; Electro-magnetic Induction (1946), Pt. I: generation of current by induction is shown by animated diagrams, and an electrically operated model railway, 22 min.; Pt. II: diagrams showing that induced electro-motive force is proportional to rate of change of magnetic flux; construction of generators, 11 min.; British Ships (1946), 11 min.; The Steam Engine (1946), steam power and the reciprocating engine, Watt's engine, the Rocket, and the modern locomotive, 11 min.; The Steam Turbine (1946),

the rotary steam engine, Parsons' steam turbine, ships' turbines, turbo-generators in large power-stations, 11 min.

LIFE CYCLE OF PIN MOULD, germination of spores, development of mycelium and sporangia; animated diagrams of conjugation, 10 min.; LIFE CYCLE OF MAIZE, time-lapse photography of germination and growth, photomicrographic study of stomatal action in leaf, experiments on mineral requirements, 10 min.; LIFE CYCLE OF THE NEWT, growth stages from egg, through tadpole to adult newt; the three species are shown, 11 min.; LIFE CYCLE OF THE ONION, speeded-up germination, diagrams of bulb formation, flowering and fruiting, 11 min.; LIFE OF THE RABBIT (1945), world distribution, feeding, burrowing, breeding and defence, diagrams of reproductive organs of the female and of embryos, 11 min.; DEVELOPMENT OF THE RABBIT, an evolutionary sequence in embryology, from sea urchin to rabbit; embryology of rabbit, dissections and animation, 35 min.

SURGERY IN CHEST DISEASES (1943), a civilian Chest Surgery Centre, stages from early diagnosis by mass radiography to rehabilitation and final cure, an operation for total removal of the lung 45 min. The film has been highly praised in the medical press of Britain. TECHNIQUE OF ARTIFICIAL PNEUMOTHORAX (1946), object of Artificial Pneumothorax, and indications for its treatment, apparatus, technique for induction and refill, and difficulties that may be encountered, 25 min.; ACCIDENT SERVICE (1943), depicts the service provided for injured miners at a hospital and a rehabilitation centre; surgical treatment and subsequent rehabilitation, 40 min., shorter version for general audiences, THEY LIVE AGAIN; EDUCATION OF THE DEAF (1946), clinics and schools provide training for deaf children, 52 min.

British Film Institute, 164 Shaftesbury Avenue, London, W.C.2. *Tel.:* Temple Bar 1642. Chairman, P. Gordon Walker, M.P.; Director, Oliver Bell.

Founded 1933 with the object of promoting the use of the cinematograph as a means of entertainment and instruction. Its concerns are managed by a Governing Body consisting of nominees from the Home Office, Board of Trade, Scottish Office, Association of Education Committees, Royal Society of Teachers, British Institute of Adult Education, Kinematograph Renters' Society, Cinematograph Exhibitors' Association and the British Film Producers' Association. It is financed by grants from the Sunday Cinematograph Fund. Membership (two guineas per annum) is open to all interested in the development of the Cinematograph as a means of entertainment and instruction.

Its staff include Mr. R. W. Dickinson, Secretary and Deputy

Director; Mr. Lindgren, Curator of the National Film Library; and Mrs. Muirhead, Information Department. Its activities include the following, all of which have some strictly scientific aspects, or deal with scientific subjects in part:

National Film Library, 35 and 16 mm. prints of 100 films, illustrating the history and technique of the cinema; maintained in London. Some of these bear indirectly on scientific subjects. Available on loan, with preferential rates to members.

Publications, two periodicals, *Sight and Sound* (quarterly) and *Monthly Film Bulletin*, which contains scientific film critiques, based on appraisals by a number of scientific committees, including experts in the various subjects. *Pamphlets* and *Reports* on educational and other uses of the film; *Subject Lists* of films on many subjects, including scientific topics.

The *Information Department* has an index of a great deal of practical material covering all aspects of the technical, social, educational, cultural and scientific cinema. It has also a reference library.

International Work. The Institute is represented in the international field through its Chairman, Mr. P. Gordon Walker, M.P., who is the Vice-Chairman of the British Council, and who is a member of the National Co-operating Body for UNESCO.

The Institute is the agent of the Ministry of Education for the certification of films for import and export purposes, as being of an educational character.

Development Work. The Institute, where appropriate, is prepared to initiate new development both by subventions and advisory services, in educational (until 1947), cultural and scientific matters; and to foster liaison with the technical and professional side of the film industry both in production and distribution.

(For Scottish work, see Scottish Film Council, p. 135.)

British Standards Institution, 28 Victoria Street, London, S.W.1. *Tel.:* Abbey 3333. Chairman of General Council, Sir William Larke, K.B.E.; Director, Percy Good, C.B.E.

National organisation for promulgation of British Standard terms, definitions, codes of practice and specifications for materials, articles, etc., and methods of test. Membership by election open to subjects or organisations in the British Commonwealth. Committees include:

Cinematograph Industry Standards Committee (1936), to prepare British Standards in the field of cinematography. Chairman, I. D. Wratten.

Photographic Industry Standards Committee (1938), to prepare British Standards in the field of still photography. Chairman, Dr. D. A. Spencer.

Publications.—Standards Quarterly, 2*s*. per issue; *Handbook of British Standards, B.S. No.* 1, 1943, 1*s*. 6*d*.; *Sectional List of British Standards in Cinematography and Photography, P.D.* 513, May 1946, includes the following: *B.S.* 677, 1942, Motion Picture Films; *B.S.* 777, 1938, Film Strips, Film Slides and sub-standard Glass Slides; *B.S.* 850, 1939, Definition of Cinematograph "Safety" film; *B.S.* 1015, 1942, Exciter Lamps for 35-mm. Projectors.

Central Film Library, Imperial Institute, South Kensington, London, S.W.7. *Tel.:* Kensington 3264. Secretary, A. Vesselo.

The Central Film Library incorporates the Empire Film Library and General Post Office Film Library, and now acts for the Central Office of Information, as a supply base for their mobile libraries; and a free library for the service of the general public.

The Empire Film Library was started in 1930–1 at the Imperial Institute by the Empire Marketing Board; on the cessation of the latter, the films were incorporated for distribution purposes with the G.P.O. Film Library, both groups of films being issued free from the Imperial Institute.

In 1940–1, the Ministry of Information established the Central Film Library, operating from the Imperial Institute, and incorporating the two foregoing libraries.

Catalogue (1944): some 400 titles, most of which are factual, and many of which are on scientific subjects; *Supplementary List* (1946) (see also Central Office of Information, below).

Central Office of Information, Norgeby House, Baker Street, London, W.1. *Tel.:* Welbeck 4420. Director, Films Division, R. E. Tritton.

The Films Division of the C.O.I. is responsible for producing films for all Government Departments, and for arranging the distribution of these films both in the United Kingdom and overseas. The films cover a wide and varied field: scientific achievement, industrial welfare, health and education, agriculture and medicine, are some of the subjects covered. Films designed to help the export drive are also made for the Board of Trade, and cover such subjects as British civil aircraft, pottery, shipbuilding, the radio industry, scientific instruments and hydro-electric achievements.

Apart from normal commercial distribution, C.O.I. films are distributed non-theatrically through two channels, namely, their regional offices, and the three film libraries. Distribution overseas is effected on application to the Films or Information Officer at the Embassy or Legation of Great Britain, in the capital of the country concerned.

Regional Offices.

(Where there are no facilities for showing films, application should be made to the regional Films Officer at the appropriate

regional office, which will arrange for shows to be given by mobile units of projector and operator.)

Northern Region, Metrovick House, Northumberland Road, Newcastle-on-Tyne, 2. *Tel.:* 27351. Northumberland, Durham, Cumberland, Westmorland, and Yorkshire–North Riding.

East and West Ridings Region, 7 Wetherby Road, Leeds. *Tel.:* 58241. Yorkshire–West Riding and East Riding.

North-Midland Region, Sherwood Buildings, South Sherwood Street, Nottingham. *Tel.:* 46221. Nottingham, Lincolnshire, Leicestershire, Rutland, Northamptonshire, Derbyshire except High Peak District.

Eastern Region, Leighton House, Trumpington Road, Cambridge. *Tel.:* 55461. Norfolk, Suffolk, Huntingdonshire, Cambridgeshire, Bedfordshire, Essex and Hertfordshire, except parts of Essex and Hertfordshire.

London and South-Eastern Region, 70 Victoria Street, London, S.W.1. *Tel.:* Victoria 8522. Greater London, Middlesex, Kent and parts of Essex and Hertfordshire.

Southern Region, The Governor's House, Forbury Road, Reading. *Tel.:* 60226. Buckinghamshire, Oxfordshire, Berkshire, Hampshire, Dorset and Channel Islands.

South-Western Region, 15 Belgrave Road, Bristol, 8. *Tel.:* 37026. Cornwall, Devon, Somerset, Wiltshire, Gloucestershire.

Wales, 2 Cathedral Road, Cardiff. *Tel.:* 9213.

Midland Region, Lombard House, Great Charles St., Birmingham. *Tel.:* Central 7234. Staffordshire, Warwickshire, Worcestershire, Shropshire, Herefordshire.

North-Western Region, 3 Cross Street, Manchester. *Tel.:* Deansgate 2173.

Scotland, Scottish Information Office, St. Andrew's House, Edinburgh, 1. *Tel.:* 33433.

Northern Ireland, Press and Publicity Office, Government of Northern Ireland, Stormont Castle, Belfast, N. Ireland. *Tel.:* 63210.

Film Libraries.—Interested organisations who have their own projection facilities can apply direct to their nearest Film Library, from which they can obtain copies of C.O.I. films on loan free of charge:

Central Film Library (see p. 131).

Scottish Central Film Library (see p. 135).

Film Library of the South-Western Region, Dartington Hall, Totnes, Devon.

Publications.—*Film Lists and Leaflets* on the following: General, Health, Country Life, Films for Farmers, Films for Gardeners, Medicine and Surgery.

Ministry of Education, Curzon Street House, Curzon Street, London, W.1. *Tel.:* Mayfair 9400.

The Ministry has set up two Committees to deal with policy and action on visual aids in education. They are:

Committee for the Preparation and Production of Visual Aids (Committee "A", or The Minister's Committee), Ministry of Education, 23 Belgrave Square, London, S.W.1. *Tel.:* Sloane 4522. Chairman, H. D. Hughes, M.P.; Secretary, Mrs. R. Marcousé.

This Committee is concerned particularly with the production of the programme of films and other visual material formulated by the National Committee (see below). These films will, when possible, be produced commercially, otherwise under the sponsorship of the Ministry of Education through the Central Office of Information.

This Committee is also concerned with problems of apparatus and distribution, and representatives on the Committee include the Kinematograph Manufacturers' Association, the Federation of Documentary Film Users, the Association of Specialist Film Producers, the Film Strip Producers' Association, the Government Cinematograph Adviser and other Government Departments as well as six representatives of the National Committee.

National Committee for Visual Aids in Education, 79 Wimpole Street, London, W.1. *Tel.:* Welbeck 2672. Chairman, H. H. Williams; Secretary, R. J. Thom.

This Committee (Committee "B") was formulated in 1946 to plan a visual education policy, to collate views of local education authorities, teachers' organisations and kindred bodies, to determine a production programme of visual aids, to nominate advisors in the production of films, and to encourage the provision of facilities for the use of visual aids in education.

It is composed of representatives of local education authorities and of teachers' organisations.

Publications.—Report on the Provision of Apparatus for Schools, 1947, 6*d.*; *Progress Report*, 1947, 6*d.*

Educational Foundation for Visual Aids (1948), c/o Ministry of Education. Chairman, Sir Rolande Wall, Assessor to the Governors, G. G. Williams.

The Foundation will act as a distributing agency for film, filmstrip, and other visual aids.

Films.—INSTRUMENTS OF THE ORCHESTRA, 35 and 16 mm., 20 min.; NEAR HOME, 35 mm., 25 min.; Visual Unit on WATER SUPPLY recently completed.

Ministry of Fuel and Power, Westminster House, 7 Millbank, London, S.W.1. *Tel.:* Abbey 7000.

Coal Mining Today, 35 mm., 18 min.; Furnace Practice, 35 mm., 30 min. The Cumberland Story, rediscovery and working of a lost band of coal-seam under the Irish Sea, 16 mm., M.F. Also technical films by:

Safety in Mines Research Board, Portobella Street, Sheffield, 1. *Tel.:* 27511. Twelve titles, all 16 mm., St., O or S to organisations engaged in mining education, research or allied interests: Coal-dust Explosion (1932), 400 ft., 15 min., crushing of coals, laying of dust on an underground roadway, and effecting an explosion; Shotfiring (1936), 400 ft., 15 min., practice in permitted mining explosives in accordance with regulations; Sand Clay Stemming (1931), 15 min., greater efficiency of sand and clay mixture, as compared with clay, as a stemming material for shotfiring.

Protective Equipment (1937), 420 ft., 18 min., protective equipment in use in the coal mine, and in other industries such as sandblasting, steel smelting, etc.; Testing of Flameproof Electrical Equipment (1937), 400 ft., 15 min., routine tests at the Home Office Testing Station, Buxton, for certifying safety of electrical equipment; Packing (1932), 400 ft., 15 min., building of stone packs in mining; Machine Undercutting (1932), 400 ft., 15 min.; Arc Wall Mining (1935), 2 parts, each 400 ft., 30 min. in all; Roadheads (1939); Treatment of Steel Supports (1935), 400 ft., 15 min.; Ground Movements (1931), 380 ft., 13 min., diagrammatic representation of an experiment to study formation of breaks in advance of the coal face; Suppression of Airborne Dust by the Use of Water (1945), parts 1 and 2, each 400 ft., 30 min. in all.

Ministry of Food, Portman Court, Portman Square, London, W.1. *Tel.:* Welbeck 5500.

How to Cook Fish, 11 min.; How to Make Jam, 11 min.; How to Make Cakes, 10 min.

General Post Office, London. *Tel.:* Monarch 9876.

Cable Jointing, 35 mm., 18 min., M.

Ministry of Health, Whitehall, London, S.W.1. *Tel.:* Whitehall 4300.

Is instrumental through the Central Office of Information in releasing films for general and specialist audiences. They include:

Blood Transfusion, 35 and 16 mm., Sd., M., 38 min., a survey of progress in practice of blood transfusion; also a shorter version, 21 min., for general audiences; Neuro-Psychiatry, treatment of patients, and rehabilitation from neuroses; suitable for nurses, social workers and medical audiences, 35 and 16 mm., Sd., M., 68 min.; Scabies, habits of the mite, diagnosis and treatment, 35 and 16 mm., M., 36 min.; Scabies Mite, instructional for

specialists and students, 35 and 16 mm., M., 7 min.; SCABIES (1946), 35 mm., Sd., M., 26 min.

DIPHTHERIA, Trailer No. 10, cartoon film, 1 min.; series YOUR CHILDREN'S . . ., including YOUR CHILDREN'S EYES, . . . EARS, . . . TEETH, YOUR CHILDREN AND YOU, 35 mm., 32 min., Sd., M.; YOUR CHILDREN'S MEALS, 35 and 16 mm., 13 min., Sd.; PENICILLIN IN MEDICAL PRACTICE, 16 mm., 32 min., Sd., C.; PATENT DUCTUS ARTERIOSUS, a record of operation for the closure of the ductus, 35 and 16 mm., 27 min.; POLIOMYELITIS, 1947.

Metropolitan Police, New Scotland Yard, London, S.W.1.

Criminal Investigation Department, ALL THINGS EQUAL, a training film, 35 mm., 22 min.

Middlesex County Council, Guildhall, Westminster, London, S.W.1. *Tel.:* Whitehall 4400.

PENNY IN THE POUND, disposal of sewage, 16 mm., 20 min.

Ministry of Labour and National Service, 6 St. James's Square, London, S.W.1. *Tel.:* Whitehall 6200.

Training and informational films: INSTITUTIONAL DOMESTIC SERVICE, 16 mm., 35 min.; AS OTHERS SEE US, 16 mm., 20 min.; HOW TO INTERVIEW; COTTON COME-BACK (in conjunction with the Board of Trade), 35 mm., 25 min.; RAILWAYMEN, 35 mm., 22 min.

Department of Scientific and Industrial Research, Park House, 24 Rutland Gate, London, S.W.7. *Tel.:* Kensington 9022. Director, Sir Edward Appleton, F.R.S.

The Department has made some experiments in producing films on some aspects of its work, chiefly on building research, roads, forest products, food and chemical research, all 16 mm., and, with two exceptions, all silent. Any one with a particular interest in these should apply to the Department.

The Central Office of Information is undertaking for the Department the production of a number of films on the Department's work; when completed these will be available on loan to scientific and technical audiences.

The Department is also developing its own technical programme on subjects of a specialised kind, but this is as yet necessarily on a limited scale.

Scottish Central Film Library, see Scottish Film Council.

Scottish Film Council, 2 Newton Place, Glasgow, C.3. *Tel.:* Douglas 6991. Chairman, C. A. Oakley; Director, D. M. Elliot; Secretary, Miss M. B. Smith.

The Scottish Film Council was established in 1934 as the instrument of the British Film Institute in Scotland; its affairs are administered by a Council elected to represent film interests,

educational affairs and public interests. It acts as a focus for cultural film activities, including the scientific, in Scotland.

Prior to the 1939 war, its principal activities were educational, in conjunction with educational bodies, particularly the Scottish Educational Film Association. During 1939–45, it acted for the Ministry of Information in distributing its films; since 1945 it has set up an Industrial Panel to investigate and promote the use of films in industry.

It encouraged the formation of the Scottish Committee of the Scientific Film Association (1942) by the Scottish Federation of Scientific Film Societies (1941), and provides its administrative headquarters.

The *Scottish Central Film Library* maintains a collection of 4,000 copies of over 1,000 film titles, about half of which are on scientific topics. It exists to supplement the libraries of Local Education Authorities, to act as their central purchasing agent, and to supply specialised films to these and to other organisations such as scientific film societies.

Catalogue (1948): 2*s*. *Supplements* (1948).

Scottish Office, Fielden House, 10 Great College Street, London, S.W.1. *Tel.:* Whitehall 7464; and St. Andrew's House, Edinburgh, 1. *Tel.:* Edinburgh 33433.

IT BEGAN ON THE CLYDE, treatment of neuroses, 35 mm., 15 min. (Dept. of Health for Scotland); CLEAN FARMING, 16 mm., 35 min.; SEED OF PROSPERITY (POTATOES), 35 mm., 19 min.; THE GLEN IS OURS, 35 mm., 31 min. (Dept. of Agriculture for Scotland).

Ministry of Supply, T.R.E., C.S. (AO Film Unit), Great Malvern, Worcestershire.

This film unit has produced, and is producing, technical films on radar, other than those produced by the Army and Navy. Some of these are available for showing by other organisations; application should be made to the Ministry of Supply. All are Sound, except where otherwise stated. They include:

RADAR (AGLT): BASIC PRINCIPLES AND OPERATIONS, 40 min., C.; AYD OPERATIONAL PRINCIPLES AND USE OF AYD ALTIMETER (1944), 10 min., C.; AYD MAINTENANCE, detailed instruction for mechanics (1944), 10 min., C.; BASIC RADIOLOCATION, introductory film on first principles, 10 min., M.; RDF TO RADAR, historical record film (1946), 50 min., M.; RADAR WEATHER, Pt. I: theoretical causes and actual effects of super-refraction; Pt. II: climatic and meteorological background of super-refraction (1945), 15 min. each part, M.; REBECCA MK IIIN (Fleet Air Arm), basic principles, tactical uses and operation of the equipment (1945).

Treasury Department, Whitehall, London, S.W.1. *Tel.:* Whitehall 1234.

POOL OF CONTENTMENT (typing pool), TYPING TECHNIQUE, 24 min., both 35 mm.

War Department, Whitehall, London, S.W.1. *Tel.:* Whitehall 9400.

A.B.C.A. Film Magazine.

Department of Army Kinematography, 36 Dover Street, London, W.1. *Tel.:* Regent 8070. All 35 mm.

THE ARMY GOES BY AIR, a series of films in 11 parts; BEACH RECOVERY, 140 min.; COMBINED OPERATIONS, 110 min.; EDUCATION, 10 min.; OUR DAILY BREAD, 30 min., opportunities in food manufacturing occupations.

Ministry of Works, Lambeth Bridge House, Albert Embankment, London, S.E.1. *Tel.:* Reliance 7611.

CIVIL ENGINEERING, 35 mm., 14 min.

(2) LEARNED AND PROFESSIONAL BODIES.

Association of Ciné-Technicians, 2 Soho Square, London, W.1. *Tel.:* Gerrard 8506. Secretary, G. H. Elvin.

The professional organisation of film technicians and film employees.

Publications—Ciné-Technician, periodical.

Association of Scientific Workers, Films Committee, 15 Half Moon Street, Piccadilly, London, W.1. *Tel.:* Grosvenor 4761.

The first national organisation in Britain to give attention specifically to scientific films. The Association is a trade union of scientists catering for the economic interests of its members, with also the wider aim of improving public understanding and appreciation of science.

The Association realised early the value of films as a medium for interpreting science to the general public, and set up in 1938 the Scientific Film Committee, an *ad hoc* body, to promote the interests of the scientific documentary film by encouraging the exhibition of scientific films, and by ensuring that the films shown did not distort scientific facts or principles. The Association also initiated in 1938 the London Scientific Film Society, an independent organisation whose main function is to exhibit films to members. During the next few years many similar societies were set up in various parts of the country, largely at the instigation of local branches of the Association. Those branches which were unable to start permanent film societies held film shows frequently, to which the general public were invited. By 1943 some twenty scientific film societies were in existence, and the Association instigated the formation of the Scientific Films Association.

To assist societies in the wise selection of films, the Committee

developed a system of appraisal and grading, by panels consisting of film technicians, subject experts, and one or two non-scientists. Critical appreciations (appraisals) were made, any factual errors being noted; the films were then graded into the following categories: suitable for general audiences, for subject experts, for teaching or for training. Appraisals so made were published, and film lists were issued containing technical data, according to the particular function of the film in question. When this work was transferred in 1944 to the Scientific Film Association, over 300 films had been appraised and graded.

Publication.—Notes on the Formation of Scientific Film Societies (1946).

British Kinematograph Society, 2 Dean Street, London, W.1. *Tel.:* Gerrard 7368. President, I. D. Wratten; Secretary, R. H. Cricks.

A technical society, encouraging the educational and scientific aspects of cinematography; its new constitution as a learned Society was adopted in 1945.

British Medical Association, Tavistock House, Tavistock Square, London, W.C.1. *Tel.:* Euston 1644.

The Association has plans for formation of a Medical Film Bureau and for establishment of a Medical Film Library.

Cambridge University Educational Film Council (1947), President, Sir Laurence Bragg; Chairman, G. S. Kitson-Clark; General Secretary, C. D. Pegge, University Engineering Laboratory. Founded to promote the use of films in higher education and for the purpose of academic research.

Electrical Trades Union, 324 Gray's Inn Road, London, W.C. *Tel.:* Terminus 5115.

Has sponsored A POWER IN THE LAND, 16 mm., 4 reels, 40 min., on the technical developments in electricity, and its social values.

Federation of English and Welsh Film Societies (1945), c/o British Film Institute, 164 Shaftesbury Avenue, London, W.C.2. *Tel.:* Temple Bar 1642. Hon. Secretary, Oliver Bell.

Federation of Scottish Film Societies (1934), Film House, 6 Hill Street, Edinburgh, 2. *Tel.:* 34203. Hon. Secretary, Forsyth Hardy.

Publication.—Film Forum, periodically.

Federation of Scottish Scientific Film Societies (1943). Founder Chairman, Dr. G. Dunlop.

Instituted to encourage the use and production of scientific films in Scotland, and the development of scientific film societies.

On the formation of the Scientific Film Association (Great Britain), the Scottish Federation became reconstituted as the Scottish Committee of the Scientific Film Association (see below). Chairman, Dr. B. Lloyd; Secretary, A. Orr, c/o 2 Newton Place, Glasgow, C.3.

Iron and Steel Trades Confederation, 324 Gray's Inn Road, London, W.C.1. *Tel.:* Terminus 6691.

A 35 mm., 33 min. film on the development of the Industry.

National Farmers' Union, 45 Bedford Square, London, W.C.1. *Tel.:* Museum 7525.

UNITED HARVEST, 35 mm., 17 min., proposals for a world plan for agriculture.

National Federation of Educational Film Groups (1947). Secretary, A. Gillatt, Colmers Farm Secondary Modern School, Rubery, Birmingham.

The Federation plans the publication of: *Guide to Film Groups*, and a *National Survey of Educational Film Materials*, in several parts; *in preparation:* Biology, Geography.

National Foundation for Research in Education, 79 Wimpole Street, London, W.1.

Natural History Film Production Society (1946). President, J. C. Elder; Organising Secretary, R. Riddell Black, 83 Hill Street, Glasgow, C.3; Secretary, T. A. Stuart, 2 Cameron Drive, Bearsden, Renfrewshire. *Tel.:* Bearsden 2965.

Founded to widen the appreciation of Nature, by encouraging and assisting the production of films on natural history, and the giving of film shows.

Royal Photographic Society, 16 Princes Gate, London, S.W.7. *Tel.:* Kensington 3334.

Committee of Kinematograph Section. Chairman, S. Schofield; Hon. Secretary, K. S. Ankersmit.

Meetings of the society include those where addresses on the scientific and technical aspects of kinematography are discussed.

Royal Society of Medicine.

During 1944–5 the Society maintained jointly with the Scientific Film Association an investigation into medical films. The results have been published, in the form of a catalogue, listing 800 medical films, fully indexed, with a synopsis and details of gauge, sources of availability and other data for programme showing. Enquiries and orders to ASLIB, 52 Bloomsbury Street, London, W.C.1. Price 7*s*. 6*d*.

Scottish Educational Film Association, 2 Newton Place, Glasgow, C.3. *Tel.:* Douglas 6991. President, J. B. Frizell; Organising Secretary, James Barr.

Founded 1934 by merging of the Sight and Sound Association with the Scottish Educational Cinema Society. Its aims are to foster interest in, and to promote the use of, the educational film and other visual aids in education. It organises a panel of speakers,

holds exhibits of educational films and visual aid equipment, and collects and distributes information about educational films and visual aids.

Its *Research Committee* undertakes research work on the use of visual aids. Its *Reviewing Panels* review and report on all educational films and film strips, including those on scientific subjects. In co-operation with the Scottish Film Council, these reports are issued in the *Scottish Educational Film Review.*

There are fourteen branches throughout Scotland, each corresponding to an Education Area.

Publications.—Handbook 1937; *Handbook* 1938; *Educational Film Bulletin* (twice yearly at present); *Research Publication No.* 1. *Attendance of School Children at the Cinema.* Further research publications are in preparation.

Scientific Film Association, 24 Soho Square, London, W.1. *Tel.:* Gerrard 1620. President, C. Sylvester; Hon. Secretary, Miss Jeanne Urquhart; Assistant Secretary, Miss E. Preston. *Scottish Committee:* 2 Newton Place, Glasgow, C.3. *Tel.:* Douglas 6991. Chairman, Dr. B. Lloyd; Hon. Secretary, A. Orr.

The Association is the central organisation in Great Britain dealing with all aspects of the scientific film. It is a voluntary, non-profit-making body governed by a Council elected annually by the members. The business of the Association is carried out by a number of standing Committees severally responsible for: Educational Films, Film Appraisal, Film Production, Film Strip, Industrial Films, International Relations, Medical Films, Press and Publications, Pure Sciences, Scientific Film Societies and Technical Standards.

The Association has done pioneer work in establishing scientific methods of film appraisal; it has published a selective graded catalogue of *Films of General Scientific Interest*, as well as a number of film lists dealing with particular subjects. In all, over 2,000 films have been listed, and a large number of them appraised.

The Association has acted as a consultant for film-producing organisations and has taken the lead in devising a joint production scheme for industrial training films. On behalf of the Ministry of Education, full plans for a visual unit on *Water Supply*, comprising films, film strips, charts and teaching notes, were drawn up and carried out under the Association's guidance.

The formation and smooth running of Scientific film societies throughout the country is one of the main aims of the Scientific Film Association. Over thirty societies are now affiliated, totalling about 10,000 members. Close liaison is maintained with many organisations and individuals of similar interest overseas. In partic-

ular, the Association, in co-operation with the French Institut de Cinématographie Scientifique has set up an International Scientific Film Association, to help the international exchange of films and knowledge throughout the world.

This summary is of necessity but a brief survey of the many varied activities and interests of the Association; but there are other facilities such as film booking, regular bulletins, and meetings open to members.

Established in 1943, the Association has already established itself in the British and International film world, and its continuing growth ensures that the scientific approach to the production, distribution and use of films shall be widely recognised and employed.

Publications.—Catalogue of Films of General Scientific Interest, pp. 188, 5*s*.; four *Handlists of Films of Medical Interest*, Dec. 1944, out of print, Feb. 1945, 6*d*., Aug. 1945, 6*d*., Feb. 1946, 6*d*.; *Catalogue of Films on Anaesthesia*, mimeographed, 3*s*. 6*d*., 1946; *Films of Interest to Physiotherapists*, I. "Physiotherapy Techniques", 1*s*.; II. "Orthopaedics and Rehabilitation", 1*s*., 1946.

Subject lists of films, mimeographed, on: Veterinary Teaching, 1945, 2*s*. 6*d*.; Industrial Films, 1946, 2*s*.; Town Planning, 1946, 1*s*.; Food and Nutrition, 1946, 1*s*.; Food Manufacture, 1947, 1*s*.; Mathematics, 1947, 6*d*. In preparation: Agriculture, 2*s*.; Astronomy, 6*d*.; Schools, 1*s*.; Vocational Training, 1*s*.

A complete list of publications up to March 1947 has been compiled by the Association.

Scientific Film Societies.

Aberdeen Scientific Film Club (1940). Hon. President, Sir William Hamilton Fyfe; Hon. Secretary, D. Cameron, 76 Desswood Place. 280 members.

Alloa Scientific Film Society (1946). Hon. Secretary, H. G. Armitt, 51 Smithfield Loan, Alloa, Scotland. 94 members.

Ardrossan Scientific Film Society (1941). Hon. Secretary, W. T. Cunningham.

Ayr Scientific Film Society (1941), Hon. Secretary, Dr. G. Dunlop, 129 Whittleleas Road, Ayr. 72 members.

Bath Scientific Film Society (1947), c/o Technical College. Chairman, Major Castle; Hon. Secretary, M. Catlin.

Bradford Scientific Film Society, c/o Technical College, Bradford, Yorks. Chairman, Dr. Howell, Physics Department, Technical College.

Brighton College Film Society, Scientific Section, Brighton, Sussex. President, W. H. Lloyd.

Burnley and District Scientific Film Society (1947). President, Dr. J. Claymore; Hon. Secretary, A. B. Wolkinson, Mining Department, Burnley Municipal College, Lancs.

Cheltenham Film Society, Scientific Films Group, c/o Civic Playhouse, Cheltenham. 1,200 members, in scientific film group. Secretary, Miss B. Hamer, 18, Cakebridge Road.

Dalmellington Scientific Film Society. President, Dr. E. S. Lee, Dalmellington, Ayrshire.

Dollis Hill Scientific Film Society, G.P.O. Research Station, London, N.W.2.

Dundee Scientific Film Society (1945). Hon. Secretary, J. C. Eaton, Mathematics Department, Technical College, Bell Street. *Tel.:* Dundee 2096. 300 members.

Edinburgh Scientific Film Society (1944). President, Professor J. Ritchie; Hon. Organising Secretary, W. Newlands, 31 Craigs Crescent, Edinburgh, 12. 700 members.

Falkirk Scientific Film Society (1943). Hon. Secretary, J. Walker, 35 Oliver Road, Falkirk, Stirlingshire. 150 members.

Farnborough Scientific Film Society, c/o Hon. Secretary, 134 Ship Lane, Farnborough, Hants.

Fuel Research Station Scientific Film Society, Blackwall Lane, East Greenwich, London, S.E.10. Hon. Secretary, S. H. Richards.

Glasgow Scientific Film Society (1941), c/o Royal Technical College, Glasgow, C.1. Chairman, Professor J. Small; Hon. Secretary, A. Orr. 250 members.

Production Group films, 16 mm., St. BLOOD TRANSFUSION, THE FILTER, TRAIN TO WIN, were made in conjunction with other organisations under the direction of the Society's President, F. Marshall. THE FILTER received awards at the Scottish Amateur Film Festival, 1948 and the International Amateur Meeting, Prague, 1948.

Harpenden Scientific Film Society, c/o Hon. Secretary, 23 Milton Road, Harpenden, Herts.

Harrow Scientific Film Society, Hon. Secretary, H. Grimshaw, 188 Yeading Avenue, Royner's Lane, Middlesex.

Hayes Scientific Film Society, c/o Hon. Secretary, 64 Hitherbroom Road, Hayes, Middlesex.

Huddersfield Scientific Film Society. President, Dr. A. Brown; Chairman, Mr. N. Nirstwood; Hon. Secretaries, Mr. D. Copper, Dr. G. H. Keats, c/o Technical College, Huddersfield, Yorkshire.

Hull Scientific Film Society, Hon. Secretary, R. S. Glover, University College, Hull.

Ipswich Scientific Film Society (1945). President, E. Gordon; Hon. Secretary, Mr. W. Green, 17 Jefferies Road. 150 members.

Leeds Scientific Film Society. Hon. Secretary, G. B. Oates, 10 Omberley Gardens, Leeds, 8.

Lincoln Scientific Film Society, Hon. Secretary, J. K. Marshall, 151 Wragby Road, Lincoln.

London Scientific Film Society, 34 Soho Square, London, W.1.

Maidenhead Scientific Film Society, Hon. Secretary, A. W. Kent, Old Court Road, Cox Green, Maidenhead, Berks.

Manchester Scientific Film Society. Chairman, M. Reeves; Hon. Secretary, E. Stafford, 76 Manchester Road, Swinton, Manchester.

Monsanto Scientific Film Society, Hon. Secretary, J. W. Barrett, Ruabon, North Wales.

North Acton Scientific Film Society, Hon. Secretary, A. H. Barron, Acton Bolt Co., 26 Chase Road, London, N.W.10.

Nottingham Scientific Film Society (1942). President, C. E. D. Meyer; Chairman, Dr. G. I. Hobday; Secretary, Dr. W. Wilson, 5 Park Avenue, Mapperley Road.

Oxford University Scientific Film Society, c/o retiring Chairman, S. C. Wallwork, Brasenose College, Oxford.

Prestwick Scientific Film Society (1943). Hon. Secretary, T. Leslie, 5 Southpark Avenue, Prestwick, Ayrshire. 70 members.

Sheffield Scientific Film Society, c/o Hon. Secretary, Day Technical School, West Street, Sheffield 1.

Slough Scientific Film Society, Hon. Secretary, J. D. Jones, 34 Clifton Road, Slough. Chairman, R. F. Dennington.

South-West Essex Scientific Film Society, c/o A. E. Judd, Hon. Secretary, 54 Beech Hall Road, Higham's Park, London, E.4.

West London Scientific Film Society, c/o Hon. Secretary, J. L. Morgan, 41 Yew Tree Road, London, W.12.

York Scientific Film Society, c/o S. Tyson, Technical College, Clifford Street, York.

(All Scottish Scientific Film Societies are affiliated to the Scottish Committee of the Scientific Film Association; many English Scientific Film Societies are affiliated to the Scientific Film Association.)

Universities and Comparable Institutions.

In general, films made at University Departments are for purposes of instruction and record; they are not normally available for widespread loan, and are chiefly used as illustrations to particular lectures or of specific researches.

Work of this kind in Britain includes the following:

Cambridge: Cavendish Laboratory, Sir Laurence Bragg, BUBBLE MODEL OF A METAL, 16 mm., M., St.

Strangeways Laboratory, Dr. A. P. Hughes, Time-lapse photomicrography by phase-contrast and by polarised light, PHAGOCYTOSIS, MITOSIS OF SEA URCHIN EGG, ELECTRO-MAGNETIC DETERMINATION OF CELLULAR VISCOSITY. 16 mm., M., St.

Glasgow: Royal Technical College. Natural Philosophy Department, T. S. Wylie, SURFACE TENSION, 16 mm., M., St., 4 min.; BROWNIAN MOVEMENT (with Dr. Q. Moore, *Bacteriology Dept.*), 16 mm., M., St., 4 min., available from Scottish Central Film Library, p. 135.

Pharmacy Dept., Professor J. Todd, BURNS (in conjunction with *Royal Infirmary*); BLOOD TRANSFUSION, both 16 mm., the former in colour.

John Innes Horticultural Institution, Merton Park, London, S.W.19. A colour film on POLLINATION AND FERTILISATION.

London, a film, showing VORTEX MOTION, Professor Andrade.

Manchester, MONEY AND UNEMPLOYMENT, Professor Polanyi.

Oxford: Sir William Dunn School of Pathology. Medical films, St., 16 mm., in colour, on ANAPHYLAXIS, 200 ft.; FUNCTION OF THE OMENTUM, 230 ft., MICROSCOPICAL OBSERVATIONS ON LIVING TISSUE, 600 ft.; PENICILLIN LABORATORY TESTS: (*a*) CYLINDER PLATE TEST, 400 ft., (*b*) TEST FOR PENICILLIN IN BLOOD SERUM, 300 ft., without sub-titles, for use with spoken commentary by lecturer; TREATMENT OF WAR WOUNDS WITH PENICILLIN, 600 ft.

Rothamsted Experimental Station, Harpenden, Herts.

VIRUS DISEASES OF PLANTS: 35 mm., St.

Universities' Film Council (1948), Chairman, Dr. G. Kitson-Clark; Hon. Sec., T. L. Green, Education Department, University, Manchester.

(3) FILM MAKERS.

Airscrew Co., Ltd., Weybridge, Surrey. *Tel.:* Weybridge 1600.

ACE OF BLADES (1943), manufacture of wooden airscrew propeller blades, 16 mm., C., 30 min.

Edgar Allen and Co., Ltd., Sheffield, Yorks. *Tel.:* Sheffield 41054.

HEAT TREATMENT OF HIGH SPEED STEEL, Sd., F.; MANUFACTURE OF TOOL STEEL, St.

Aluminium Development Association, 33 Grosvenor Street, London, W.1. *Tel.:* Mayfair 7501.

HEAT TREATMENT OF WROUGHT ALUMINIUM ALLOYS (1946), 16 and 35 mm., Sd., M., F.

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C.2. See Petroleum Films Bureau, p. 157.

Associated Ethyl Co., Ltd., Artillery House, Artillery Row, London, S.W.1. *Tel.:* Abbey 3974.

8 titles distributed, produced by Ethyl Corporation, New York, all 16 mm., Sd.: OIL FIRES, 35 min.; LOOKING AHEAD, oil refinery technique and its relation to the motor car, 25 min.; MASTERS OF THE SOIL, use of tractor for farm work, 20 min.; SLOW MOTION STUDIES OF COMBUSTION, fuel combustion in engines, 25 min.; FIRE POWER AND OCTANE, forms and qualities of gasoline in various types of combustion engines, 35 min.; THE LONG ROAD, terta-ethyl lead as anti-knock agent, 25 min.; WHERE MILEAGE BEGINS, manufacture of Chevrolet engine, 25 min.; SLOW MOTION STUDIES, circulation of coolant in a new-design hollow-head valve.

Association of Specialised Film Producers, Ltd., 3 Portman Chambers, 7–9 Baker Street, London, W.1. *Tel.:* Welbeck 5711. Chairman, H. Bruce Woolfe; Secretary, L. G. Parker.

The following member companies have produced scientific films:

Diagram Films, Ltd., 28–30 Little Russell Street, London, W.C.1. *Tel.:* Holborn 5249. *Film Producers' Guild, Ltd.*, Guild House, Upper St. Martins' Lane, London, W.C.2. *Tel.:* Temple Bar 5240. *G–B Animation, Ltd.*, Moor Hall, Cookham, Berks. *Tel.:* Bourne End 815. *G–B Instructional, Ltd.*, Film House, Wardour Street, London, W.1. *Tel.:* Gerrard 9292. *Harvey Harrison Films, Ltd.*, Harley Place, London, W.1. *Tel.:* Langham 1260. *Merton Park Studios, Ltd.*, 269 Kingston Road, London, S.W.19. *Tel.:* Liberty 4291. *Science Films, Ltd.*, The Studio, College Slip, Bromley, Kent. *Tel.:* Ravensbourne 5150. *Verity Films, Ltd.*, Guild House, Upper St. Martin's Lane, London, W.C.2. *Tel.:* Temple Bar 5240. *Wallace Productions, Ltd.*, Wallace Centre, 8 Berwick Street, London, W.C.1. *Tel.:* Gerrard 2639.

Austin Motor Co., Ltd., Longbridge Works, Birmingham. *Tel.:* Priory 2101.

12 titles, others in preparation, 16 mm., M., Sd. and St., silent films with script commentary, all photographed at 24 frames per sec. They include: HERE'S TO POWER, building an Austin engine, 18 min.; WHEN THE SOLDER SETS, making a radiator; PRECISION MAKES PERFECT, inspection and testing; WITHIN THE WHITE LINE, incorporation of safety devices in the motor car; A CAR IS BORN, the millionth car.

Avery, W. and T., Ltd., Avery House, Clerkenwell Green, London, E.C.1. *Tel.:* Clerkenwell 4301. A NEW SELF-INDICATING UNIVERSAL TESTING MACHINE (1942), with synchronised lecture, 35 and 16 mm., St., 20 min., F.

Babcock and Wilcox, Ltd., Babcock House, Farringdon Street, London, E.C.4. *Tel.:* Central 3282.

STEAM, 35 and 16 mm., 55 min., Sd., distributed by Sound Services, Ltd.

Bakelite, Ltd., 18 Grosvenor Gardens, London, S.W.1. *Tel.:* Sloane 9911. BAKELITE, MANUFACTURE AND APPLICATIONS, 35 and 16 mm., Sd., F.

Beetle Products Co., Ltd., Argyll Street, London, W.1. *Tel.:* Gerrard 7278.

BEETLE, manufacture of synthetic resins and moulding powders at the largest British moulding works, 16 mm., St., 15 min., F.

Beardmore, Wm., and Co., Ltd., Parkhead Steel Works, Glasgow, E.1. *Tel.:* Bridgeton 1881.

A ROMANCE OF ENGINEERING (1938), history of the firm, and many of its manufacturing processes.

Bristol Aeroplane Co., Ltd., 6 Arlington St., London, S.W.1. *Tel.:* Regent 3941.

BRISTOL SLEEVE-VALVE AERO-ENGINE, 16 mm., F.; AERO-ENGINE SUPERCHARGERS, 16 mm., F.

British Coal Utilisation Research Association, 54 Victoria Street, London, S.W.1.

British Cod Liver Oil Co. (Hull & Grimsby), Ltd., Hull.

ARCTIC HARVEST, 35 mm., 33 min.

British Council, see p. 128.

British Electrical Development Association, 2 Savoy Hill, London, W.C.2. *Tel.:* Temple Bar 9434.

14 titles, 35 and 16 mm., Sd. and St., on applications of electricity, including domestic purposes.

British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead Road, Surrey. *Tel.:* Leatherhead 3428.

Several films, some of which are confidential. One title available for showing: LIMITATIONS AND USE: FIELDS OF APPLICATION OF VARIOUS FIRE-FIGHTING MEDIA ON FIRES ARISING IN ELECTRICAL INSTALLATIONS (1938), a series of films showing fire-fighting tests on oil fires in the open and in enclosed buildings, cable fires in tunnels; media tested include methyl bromide, carbon dioxide, chemical foam, mechanical foam and water. 16 mm., St., part in colour, 2,500 ft., R.

British Empire Cancer Campaign, 11 Grosvenor Crescent, London, S.W.1. *Tel.:* Sloane 5756.

CULTIVATION OF LIVING TISSUE, by the late Dr. Canti, 35 mm.

British Gas Council, 1 Grosvenor Place, London, S.W.1. *Tel.:* Sloane 4454.

Twenty-four titles on aspects of gas utilisation and production, chiefly 35 and 16 mm., M., Sd., F. See *Catalogue*, 1946. Also new films:

THE NATION'S WEALTH, showing treatment of coal at a modern

gas works, use of some by-products such as tar, benzole, ammonium, sulphate and coke, 16 mm., C., Sd., 12 min., F.; TRANSFERENCE OF HEAT, a series of 3 films for schools, Sd. or St., with teaching notes fully illustrated and annotated, Pt. I, CONVECTION, Pt. II, CONDUCTION, Pt. III, RADIATION.

British Industrial Films, Ltd., Chenil Galleries, 183 King's Road, London, S.W. *Tel.:* Flaxman 0941.

Unicorn Film Strip Library includes about 20 scientific titles, such as:

WATER PLANTS; LARGER POND ANIMALS; SMALLER POND ANIMALS; EVOLUTION OF THE HAND; FLOTATION; LIGHT INTO COLOUR; EXPANSION OF METALS; HEAT CONTROL.

The foregoing are static pictures, available on sale.

British Instructional Films, Ltd. (in association with Pathé Pictures, Ltd.), Film House, Wardour Street, London, W.1. *Tel.:* Gerrard 4314. Educational Controller, A. Russell Borland.

Educational Films produced since 1919. The SECRETS OF NATURE series produced by Bruce Woolfe and Percy Smith number over 150 films, mainly on biological subjects. The current production programme includes 60 new classroom films; 29 of these now available are on scientific subjects, chiefly nature study. All are 16 mm., St., M., available R.: ELEPHANTS, 4 min., for age range 7–9 yrs.; MODERN DAIRY, 7 min., 9–12 yrs.; PELICANS, 3 min., 5–7 yrs.; SLATES, 7 min., 9–12 yrs.; BEARS, 3 min., 5–7 yrs.; CAMELS, 5 min., 6–9 yrs.; KANGAROOS, 3 min., 6–9 yrs.; SEAGULLS, 5 min., 6–9 yrs.; PENGUINS, 3 min., 5–9 yrs.; OSTRICHES, 3 min., 5–9 yrs.; BRICKS, 7 min., 9–12 yrs.; BRICKS FOR HOUSES, 4 min., 7–9 yrs.; CHALK, 8 min., 12–15 yrs.; FORGE, 5 min., 9–12 yrs.; GLASS MAKERS, 10 min., 12–15 yrs.; POTTERY, 3 min., 12–15 yrs.; GRINDING CORN, 5 min., 9–12 yrs.; WEAVING, 7 min., 9–12 yrs.; COW FAMILY, 5 min., 5–9 yrs.; GIRAFFES, 3 min., 5–9 yrs.; LIONS, 3 min., 5–9 yrs.; LLAMAS, 3 min., 5–9 yrs.; SNAKES, 3 min., 5–9 yrs.; CHAMELEONS, 3 min., 5–9 yrs.; IN THE AQUARIUM, 3 min., 5–9 yrs.; TIGERS, 3 min., 5–9 yrs.; ZEBRAS, 3 min., 5–9 yrs.; TIN-MINING, 10 min., 12–15 yrs. Film strips also in production, including SUEZ CANAL; NAME THIS PLACE.

Publications.—Catalogue of the foregoing 16-mm. films for hire, and others. *Visual Education Digest*, a booklet surveying the use of classroom films.

British Oxygen Co., Ltd., Grosvenor House, Park Lane, London, W.1. *Tel.:* Grosvenor 6311.

British Rubber Development Board, 19 Fenchurch Street, London, E.C.3. *Tel.:* Mansion House 1311.

RUBBER: Reel I, establishment of Para rubber tree, propagation

by seed and bud grafting; Reel II, budding, pollination and tapping.

The film is also issued in a 3-reel version: Reel I as above; Reel II, collection, transport and coagulation of latex; Reel III, preparation and packing of sheet latex. Films accompanied by detailed notes based on a film lecture by the Director, Mr. H. F. Page, Rubber Research Institute of Malaya, Kuala Lumpur. 16 mm., M., St., F., for postage costs.

British Thomson Houston Co., Ltd., Crown House, Aldwych, London, W.C.2. *Tel.:* Temple Bar 8090.

A series of 8 films on electrical products, all 16 mm., Sd., including ELECTRONICS IN INDUSTRY (1947), photo-electric control, Thyratron reactor control, high frequency heating, voltage regulation and speed control, F.

Cadbury's, Ltd., Bournville.

A series of 9 films, 35 and 16 mm., St. or Sd., on food and on chocolate.

Carborundum Co., Ltd., Trafford Park, Manchester, 17. *Tel.:* Trafford Park 2381.

FIRST PRINCIPLES IN GRINDING, instructional film with manual and charts, 16 mm., Sd., 45 min., O.

Cardox (Great Britain), Ltd., 20 Copthall Avenue, London, E.C.2. *Tel.:* Clerkenwell 4956.

CARDOX, use of carbon monoxide cartridge for coal blasting, 16 mm., 11 min.

Central Office of Information, see p. 131.

Central Council for Health Education, Tavistock House, Tavistock Square, London, W.C.1. *Tel.:* Euston 3341.

Twelve film titles, 35 and 16 mm., F. and S., for non-commercial use, by approved lecturers only, in Great Britain and Northern Ireland only. They include:

ROUND FIGURES, importance of good posture, light treatment of the theme, 8 mm.; FOOTSTEPS TO BEAUTY, care of the feet, 10 min.; BREATH OF DANGER, droplet infection by coughing and sneezing, 9 min.; CARRY ON, CHILDREN, health and education services of Britain, 10 min.; ROSE IN BUD, colour film on child welfare, 16 mm. only, 9 min.; A FLYING START, the importance of breast feeding, non-medical, 11 min.; YOUNG AND HEALTHY, for younger children, 12 min.; UNWANTED GUESTS, the head louse, 10 min.; SEX IN LIFE, methods of reproduction in amoeba, hydra, frog, bird and rabbit, 25 min. (available sale to approved organisations, subject to royalties payable to Gaumont British Instructional, Ltd.); HUMAN REPRODUCTION, sequel to SEX IN LIFE, giving more details about reproduction in humans, 12 min. (available sale to approved

organisations, subject to royalties payable to Messrs. Gaumont British Instructional, Ltd.).

Chart Producers' Association, 30 Chesterford Gardens, London, N.W.3. Chairman, D. W. Tyler.

Cincinnati Milling Machines, Ltd., Woodlands Farm Road, Tyburn, Birmingham. *Tel.:* Ashfield 1127.

Four titles, F. to organisations:

Physics of Metal Cutting, booklet of same title, 16 mm., M., St., 2 reels, 25 min.; Researches in High Speed Carbide Milling, 16 mm., St., M., 2 reels, 25 min.; Highway to Production, description of firm's American Associates, instruction and entertainment, 16 mm., C., Sd., 1 reel, 28 min.; Age of Precision, organisation details of firm's American Associates, concentrating on design and production of centre-less and centre-type grinding machines, 16 mm., C., Sd., 1 reel, 28 min.

Coal Utilisation Council, Grosvenor House, Grosvenor Gardens, London, S.W.1.

Buried Treasure, 35 and 16 mm.

Coxson Garrard and Co., Ltd., Oldbury.

The Manufacture of Catgut.

Crookes Laboratories, Gorst Road, Park Royal, London, N.W.10.

Two titles, 16 mm., Sd., F. Emulsions and their manufacture; Processing of Halibut Liver Oil.

Daily Mail School Aid Department, New Carmelite House, London, E.C.4. *Tel.:* Central 6000. Organising Secretary, Miss L. W. Dorey. *List* of publications, filmstrips, free. Filmstrips include: British Owls; The Fungus Family; Swimming. All S.

Daimler Co., Ltd., Claridge House, 36 Davies Street, London, W.1. *Tel.:* Mayfair 7196.

Proved for Battle, 2 reels.

Dance-Kaufmann Ltd., 18 Upper Stanhope Street, Liverpool 8. *Tel.:* Royal 3291.

Catalogue: Cycle-films, technical, 16 mm., M., St., as lengths or as loops, S.

These films are specifically planned for serious study in the classroom, to illustrate particular teaching points at particular moments during actual lessons in the classroom. There is no commentary, and no sub-titles; they are equally useful in all parts of the world, irrespective of language or dialect. With the exception of Illustrations from Nature, Cycle-films are animated diagram. Catalogue has 55 titles, including the following topics:

Kinetic Theory of Gases, 2 titles; Harmonic Motions, 2; Propagation of Waves, 6; Reflection of Light, 2; Transmission of Light, 4; Currents in Three-phase Circuit, 3; The Clock

DIAGRAM, 1; PARALLELING OF ALTERNATORS, 3; CURRENT, VOLTAGE AND POWER CURVES IN SINGLE PHASE CIRCUIT, 1; INDUCTION MOTOR THEORY, 9; ELECTRICAL CIRCUITS, 7; MECHANICAL SCIENCES, including HOW TO PROJECT CYCLE-FILMS, 4; ELECTRICAL MACHINES, 5; FAMOUS ELECTRICAL DISCOVERIES, 3; ILLUSTRATIONS FROM NATURE, 2.

Dartington Hall Film Unit, Dartington, Totnes, S. Devon. *Tel.:* Totnes 2271.

Founded 1934 to meet a demand for educational films, specifically made for classroom purposes. At the same time they endeavour to maintain a professional standard. The unit is not a commercial venture, and exists as one of the educational enterprises set up under the Dartington Hall Trust.

Purchasers and borrowers of the films include departments of the British, Dominion and foreign Governments, Universities and University Colleges at home and abroad, and more than 40 educational authorities, as well as schools, film libraries and other educational institutions. The unit has also made films for a number of public and private bodies, including the Forestry Commission, the Timber Development Association of Great Britain, Visual Education, Ltd., the Devon County Council and Penguin Books, Ltd. For the last-named the Unit has made a series of films on agriculture and rural education, entitled PUFFIN FILMS.

Catalogue.—20 titles, all 16 mm., chiefly St., R. and S.; subjects chiefly geography, rural and industrial pursuits; they include the following:

RIVERS, illustrates by photography and animated diagram the development of a river system; erosion, weakening, corrosion; river capture, alluvial plains and meanders, Sd., 20 min.; St., 15 min.; GALAPAGOS, a visual record of the Lack–Venables Expedition of 1938. The Galapagos Islands will always be connected with Darwin's *Origin of Species*, and this film shows how animal and plant life have been affected by isolation, climate and soil conditions, and how varieties, species and genera have come into existence. There are introductory sequences descriptive of the geography, flora and fauna, followed by sections on birds—flamingoes, mocking birds and finches; of outstanding interest are the pictures of a bird using a twig as a tool to extract insect larvae—a unique phenomenon which is here confirmed for the first time. Marine mammals and reptiles are shown, including iguanas, the green turtle, and the giant land tortoise. There are some concluding sequences on the tameness of the Galapagos wild animals. 16 mm., St., 30 min., R. and S.

Dental Board of the United Kingdom, 44 Hallam Street, London, W.1. *Tel.:* Langham 2804.

A series of 6 films on the teeth, 35 and 16 mm., Sd., and St., M., F.

Dorman Long and Co., Ltd., G.P.O. Box 78, Zetland Road, Middlesbrough. *Tel.:* Middlesbrough 2241.

A series of 5 titles: IMPERIAL CHEMICALS HOUSE, 16 and 35 mm., St., 30 min.; TYNE BRIDGE, 35 and 16 mm., St., 30 min.; SYDNEY HARBOUR BRIDGE, 16 mm., St., 90 min.; FORD MOTOR CO., DAGENHAM, 16 mm., St., 1 reel; CHIEN TANG BRIDGE (Study of Tides), 16 mm., St., 1 reel.

Dunlop Rubber Co., St. James's House, St. James's Street, London, S.W.1. *Tel.:* Whitehall 6700.

FAR HORIZONS, 35 and 16 mm., St., 55 min.

Edison Swan Electric Co., Ltd., 155 Charing Cross Road, London, W.C. 2. *Tel.:* Gerrard 8660.

THEY'RE CALLED ELECTRONS, elementary electronic theory, thermionic valve in radio transmission and reception, evolution of complex radio valves from the Fleming valve. 35 and 16 mm., M., Sd., 30 min., F. to institutions.

Educational and General Services, see Gaumont–British Instructional, p. 153.

Electrical Association for Women, 35 Grosvenor Place, London, S.W.1. *Tel.:* Sloane 0401. Hon. Secretary, Miss Caroline Haslett, D.B.E.

List.—12 titles on various aspects of equipment and efficiency in the home, including 6 films distributed for the Health and Cleanliness Council; films include:

'TWAS ON A MONDAY MORNING, modern laundering practice in the home as compared with less efficient methods, 16 mm., Sd., 15 min., R.; E.A.W. ALL-ELECTRIC HOUSE, BRISTOL, a descriptive film of the house built by the Association in Bristol in 1935, 16 mm., St., 15–20 min., R.

English Steel Corporation, Ltd., Vickers Works, Sheffield. Vickers House, Broadway, London, S.W.1. *Tel.:* Abbey 7777.

A film on the company's products, 16 mm., St., F.

Fairthorne, R. A., Kirk Michael, Millfield Road, Farnborough, Hants, and *Salt, B. G. D.*

List of mathematical films: 5 titles, all silent.

EUCLID, I, 32, angle—sum of a triangle, 16 mm., M., 90 ft., R., S.; THE EQUATION $\ddot{x} + x = O$, an example of a new notation by Robert Fairthorne for ordinary differential equations, 16 mm., M., 90 ft., also 35 and 9·5 mm., R., S.; THE EQUATION $\ddot{x} + x = A$ sin Nt, another example of the Fairthorne notation, but dealing with the equation for forced vibrations, 16 mm., M., 300 ft., also 35 and 9·5 mm. (9·5 version obtainable from Pathé Pictures, p. 147), R., S.; A HYPOCYCLIC MOTION, 16 mm., M., 300 ft.,

also 35 and 9·5 mm.; THE GENERATION OF INVOLUTE GEAR TEETH, 16 mm., M., 100 ft., also 35 and 16 mm., and loop-film, R., S.

Federation of Documentary Film Units, 2 Soho Square, London, W.1. *Tel.:* Gerrard 1027.

The following member organisations are concerned in the making of factual, documentary and scientific films:

Films of Fact, 25 Catherine Street, London, W.C.2. *Tel.:* Temple Bar 5116. *Merlin Film Co.*, 53 New Oxford Street, London, W.C.2. *Tel.:* Temple Bar 2092. *Documentary Technicians' Alliance*, 21A Soho Square, London, W.1. *Tel.:* Gerrard 3122. *Basic Films*, 17 Soho Square, London, W.1. *Tel.:* Gerrard 7015. *Halas Batchelor Cartoon Films*, 10A Soho Square, London, W.1. *Tel.:* Gerrard 7681. *World Wide Pictures*, 10A Soho Square, London, W.1. *Tel.:* Gerrard 1736. *Realist Film Unit*, 9 Great Chapel Street, London, W.1. *Tel.:* Gerrard 1958. *Seven League Productions*, 26 Darblay Street, London, W.1. *Tel.:* Gerrard 3566.

Film Producers' Guild, Ltd., Guild House, Upper St. Martin's Lane, London, W.C.2. *Tel.:* Temple Bar 5240. Secretary, K. Lockhart Smith.

The following associates are concerned in the making of factual, documentary and scientific films:

Greenpark Productions, Ltd., Guild House, Upper St. Martin's Lane, London, W.C.2. *Tel.* Temple Bar 0135. *Merton Park Studios, Ltd.*, 269 Kingston Road, Merton Park, London, S.W.19. *Tel.:* Liberty 4291. *Publicity Films Ltd.*, address as Film Producers' Guild. *Sound Services, Ltd.*, Filmicity House, Upper St. Martin's Lane, London, W.C.2. *Tel.:* Temple Bar 5420. *The Horizon Film Unit*, address as Film Producers' Guild. *Verity Films Ltd.*, address as Film Producers' Guild.

Firth-Brown, Ltd., Atlas Works, Sheffield, 1. *Tel.:* Sheffield 20081. *List.*—5 titles, all 16 mm., St., F., to institutions: STEELMAKING (1946), C., 45 min.; MITIA (1946), C., 36 min.; MODERN STEELCRAFT (1936), M., 50 min.; NITRALLOY STEEL (1936), M., 10 min.; MANUFACTURING OF TOOL STEELS AND SMALL TOOLS (1936), M., 15 min.

Ford Motor Co., Ltd., Dagenham, Sussex. *Tel.:* Rainham 3000.

Catalogue.—21 titles, 35 and 16 mm., Sd. and St., including: AUTOBIOGRAPHY, production of Ford motor cars, Sd., 12 min., St., 27 min.; PRECISION AND PRACTICE, performance of Ford cars, Sd., 18 min., St., 34 min.; POWER FARMING BY FORDSON, tractor work month by month, Sd., 14 min., St., 22 min.; PLAN FOR A FOUNDRY, 15 min.; FUEL AND THE TRACTOR (in collaboration with the Ministry of Agriculture), Sd. only, 18 min.

Gateway Film Productions, 84 Powys Lane, London, N.13. 16-mm. films, M., S.; scientific titles include: EXPANSION OF SOLIDS BY HEAT, 100 ft., St., and Sd.; MAKING A FARM CART, 14 min.

Gaumont-British Instructional, Ltd., Imperial House, 82 Regent Street, London, W.1. *Tel.:* Regent 7222. Educational Division, Donald Mackenzie, Principal.

Production of educational films began in 1933, with Bruce Woolfe, Miss Mary Field and the late Percy Smith, who built up the SECRETS OF LIFE series, and formed what was in 1939 the largest library of educational films, sound and silent, in the world. The biology series in particular has many films, now classics, to which many international awards have been given.

The present policy is the production of films in biology to complete the series, to remake certain earlier films on hygiene, and to make films on chemistry and physics.

Distribution on loan from: *G.B.I. Film Library*, 1 Aintree Road, Perivale, Middlesex.

Catalogue, 1946–7, over 200 titles, including the following: Botany, 11 titles, supervised by Sir Edward Salisbury; Zoology, 16 titles, supervised by Dr. Julian Huxley and Mr. H. R. Hewer; Ecology, 7; Embryology, 8; Natural History, 23; Geography, 43; Elementary Geography, 26; Geology, 6; Hygiene and Physiology, 6; Agriculture, 3; Physical Science and Technology, 8. All 16 mm., Sd. and Mute and St., M. and C., R.

New films include: SEWAGE DISPOSAL, Sd., 10 min.; LIFE-CYCLE OF A MOSS, Sd., 15 min. New films in preparation include: Physical Geography, a series of three, including the recently released LATITUDE AND LONGITUDE; Elementary Civics; Elementary Physiology (in colour); Biology, including the DOGFISH and PRIMITIVE MAMMALS; Economic Geography; Elementary Physics, to include HEAT, LIGHT, MECHANISM OF THE EYE, SOUND, MECHANISM OF THE EAR, ELECTRICITY, MAGNETISM; Chemistry, the first of which will be on SULPHURIC ACID; Botany, including TRANSPIRATION, RESPIRATION, PHOTOSYNTHESIS, THE NITROGEN CYCLE, FUNGI, including the recently released LETTUCE AND ONION, 22 min., LIVING AND NON-LIVING MATTER, 11 min., THE WILLOW TREE, 22 min.

Also ATOMIC PHYSICS, 35 mm., Sd., 90 min., M., a survey of the progress of atomic theory from Dalton to Einstein, the discovery of the electron, neutron, radio-activity, and fission of uranium. Made for university students and other audiences with some background in physical science. United States Atomic Energy has 20 prints for training its employees, and the United States Army has ordered four prints, 16 mm., Sd., M., 90 min., rental £5, sale £105.

Goodyear Tyre and Rubber Co. (Great Britain), Ltd., 56 Osnaburgh Street, London, N.W.1. *Tel.:* Euston 2811.

STORY OF THE TYRE.

Guest, Keen and Nettlefolds, Ltd., 66 Cannon Street, London, E.C.4. *Tel.:* City 5070.

THEY'RE EVERYWHERE, the production of Nuts and Bolts, 55 min.

High Duty Alloys, Ltd., Buckingham Avenue, Trading Estate, Slough, Bucks. *Tel.:* Slough 21201.

FORGING OF LIGHT ALLOYS, 16 mm. (one copy in 35 mm.), 40 min., available on direct application to firm.

Hadfield's Works, Ltd., Sheffield.

THE MAKING OF STEEL, crucible method of making steel, Siemen's open-hearth furnace, milling, forging, melting and casting in the production of steel, 45 min.

Imperial Chemical Industries, Ltd., Nobel House, 2 Buckingham Gate, London, S.W.1. *Tel.:* Victoria 4444; film enquiries to Film Section, 42 Hertford St., London, W.1.

List.—22 titles, others in preparation, 35 and 16 mm., Sd., F. to appropriate institutions; distribution from Central Film Library (p. 131). Films include:

Medical.—11 titles on TECHNIQUE OF ANAESTHESIA, in collaboration with Westminster Hospital Medical School; for approved medical audiences.

Veterinary.—4 titles on HEALTH OF DAIRY CATTLE, made in collaboration with the Veterinary Educational Trust; for veterinary students, practitioners and dairy farmers.

Agriculture.—4 titles on SOIL FERTILITY, made in collaboration with Rothamsted Research Station and I.C.I. Agricultural Research Station; for agricultural schools, Young Farmers' Clubs and farming audiences generally, including LAND DRAINAGE.

School Science.—3 titles suitable for school science, including THIS IS COLOUR.

Imperial Smelting Corporation, Ltd., 37 Dover Street, London, W.1. *Tel.:* Regent 8161.

DIE CASTING, development and application of zinc alloy for die casting; produced by associate company in U.S.A., the New Jersey Zinc Co., edited to include details of British practice, 16 mm., M., Sd., F. to technical organisations.

Kodak, Ltd., Research Laboratories, The Works, Harrow, Middlesex. *Tel.:* Harrow 4380.

Some research record films, 16 mm., St. only, running time varies with the film and the particular version used; lent occasionally by special arrangement.

HIGH-SPEED CINEMATOGRAPHY (1945 and 1947); REFLEX ACTION

OF THE PUPIL OF THE EYE (1945), in colour; COLOUR MOTION PICTURES OF THE WHOLE SKY (1946); PHOTO-ELASTIC ANALYSIS, MOVEMENT OF WHEEL ON RAIL (1944), in colour.

Kodak Ltd., Medical Department, Kodak House, Kingsway, London, W.C.2. *Kodak Medical Motion Pictures: List of Veterinary Subjects on 16 mm. Safety Film.*

Kelvin, Bottomley and Baird, Ltd., 91 Hope Street, Glasgow, C.2. *Tel.:* City 7711.

KELVIN, MASTER OF MEASUREMENT, Sd., 35 and 16 mm., 52 min.

Lead Industries Development Council, 14 Finsbury Circus, London, E.C.2. *Tel.:* London Wall 4394.

Three titles: SILVER CITY, lead mining in Australia, 16 mm., M., St., 30 min., Sd., 18 min.; VULCAN'S CRUCIBLE, smelting lead in Australia, 16 mm., M., St., 25 min., Sd., 12 min.; THE FILM OF PAINT, manufacture and application of white lead paint, 16 mm., M., St., 70 min., Sd., 40 min. All F.

London, Midland and Scottish Railway (*British Railways*), Euston, London. *Tel.:* Euston 1234.

Has resumed its pre-war programme of factual and informational films, including the completion of BLACKPOOL, THE CLYDE, LIFE OF AN ENGINE DRIVER and CARRYING THE LOAD.

MECHANISED RELAYING; PRODUCTION PLANNING.

Two-reel Colour films in preparation: THIRTY MILLION ACRES (Agriculture); THE WHEELS BEHIND THE WALLS (Housing); DOWN TO THE SEA IN TRUCKS (Shipbuilding); THE BUTCHER, THE BAKER (Food Distribution); ANIMAL, VEGETABLE, MINERAL (Textiles); HIGHWAY OF STEEL (Iron and Steel). All 16 mm.

Mather and Platt, Ltd., Park Works, Manchester 10. *Tel.:* Collyhurst 2321.

5 titles, all St., 16 mm.: TEXTILE FINISHING MACHINERY, finishing machinery, also bleaching, dyeing and printing machinery; sub-titles occur, but commentary necessary by someone familiar with the processes illustrated, 1,100 ft., 45 min.; FIRE EXTINGUISHING, Mulsifyre system of extinguishing oil fires, for use with spoken commentary by lecturer, 600 ft., 25 min.; FOOD MACHINERY, processes in modern food canneries; made partly at factory of Messrs. Batchelors Ltd., Wadsley Bridge, Sheffield, and partly at factory of Messrs. W. P. Hartley Ltd., Aintree; for use by lecturer, 300 ft., 12 min.; DEXTERITY EXERCISES, taken at the Day Continuation School of the works; can be used without running commentary, 350 ft., 14 min.; PHYSICAL TRAINING, effect of physical training on production in engineering works, 550 ft., 22 min.

Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. *Tel.:* Trafford Park 2431.

A Glimpse of Metro-vick, activities and scope of main and outlying works, some assembly aisles, research department, 35 and 16 mm., M., Sd., 30 min., F. to institutions; projector and operator sometimes provided; Planned Electrification, electrification of Bickershaw Colliery, showing new power station, etc., chiefly for technical experts and engineering students, 35 and 16 mm., M., Sd., 35 min., F. to institutions; Atomic Energy (Dr. T. E. Allibone), passage of a-particles through metals, deflection of a-particles, ionisation of atom by electron-impact, effect of neutron on Ur 238 and Ur 235, effect of neutron on groups of atoms of Ur 238 (*a*) less than and (*b*) greater than, critical size, 16 mm., M., St., 16 min., occasional loan; Radar Goes to Sea, development of radar for war service work, later development for merchant service, as Seascan radar equipment, 16 mm., 28 min., M., F.; Radar Record, record of a coastal journey, 16 mm., M., 7 min., F.

Morris Motors, Ltd., Cowley, Oxford. *Tel.:* Oxford 77777.

Fifteen titles, all 16 mm., Sd., F., include:

Mastery of Steel, manufacture of a steel panel, 712 ft.; Magic in Metal, casting a cylinder block, 700 ft.; Thread of Cotton, manufacture of a motor-car tyre, 754 ft.; Production Perfected, specialised testing, 688 ft.; Power, the production of a Morris engine, 684 ft.; Toughened Transparency, manufacture of wind-screens, 744 ft.; Price of Silence, processes in manufacture of gears, 742 ft.

National Asphalt Mineowners and Manufacturers' Council, 94, Petty France, London, S.W.1. *Tel.:* Abbey 1010.

Building Below Ground, animated film of asphalt in building, 16 mm., 16 min., C.

National Association for the Prevention of Tuberculosis, Tavistock House, Tavistock Square, London, W.C.1. *Tel.:* Euston 3012.

35 and 16 mm., Sd., R., 7 titles, including:

Papworth Village Settlement (1945), an account of the settlement in village communities having family centres and gainful occupations, while patients are under treatment; Health and Rehabilitation films; Radiography.

Nucleus Film Unit, 26 D'Arblay Street, London, W.1.

A specialised company producing medical and biological films, including: Studies in Human Lactation; Ocular Palsies, Home Nursing Techniques; Diagnosis of Threadworm Infection; Early Diagnosis of Acute Anterior Poliomyelitis (Central Office of Information, for Ministry of Health).

Norton Grinding Wheel Co., Ltd., Welwyn Garden City, Herts. *Tel.:* Welwyn Garden 701.

5 titles, made by associate company, Norton Co., Worcester;

all 16 mm., C., Sd., F., preferably accompanied by technical representatives.

NORTON ABRASIVES, grinding wheel manufacture, 20 min.; NORTON GRINDING WHEEL MARKINGS, 7 min.; OFF-HAND GRINDING WITH NORTON ABRASIVES, 10 min.; NORTON ABRASIVES IN TOOL GRINDING, 10 min.; PRECISION WITH NORTON ABRASIVES, 18 min.

Pest Control, Ltd., Harston, Cambridge. *Tel.:* Harston 312.

PEST CONTROL; THE HIDDEN ENEMY; two other titles in preparation.

Petroleum Films Bureau, 46 St. James's Place, St. James's Street, London, S.W.1. *Tel.:* Regent 7565.

Catalogue.—38 titles, 35 and 16 mm., M., Sd., all F. to institutions; include: General Interest, 11 titles, all on scientific subjects; Oil Production and Refining, 15 titles; Motor Cars, etc., 10 titles; Road Safety for Children, 3 titles.

Photomicrography, Ltd., Whitehall, Wraysbury, Bucks.

A company specialised for ciné-biology, particularly those involving the use of the microscope and time-lapse technique; in preparation, several series of colour films in agriculture for Shell Oil Co.

Rolls-Royce, Ltd., 15 Conduit Street, London, W.1. *Tel.:* Mayfair 6201.

CONTRIBUTION TO VICTORY, development of the Merlin engine, available only for private showing by the company.

Royal Society for the Prevention of Accidents, 52 Grosvenor Gardens, London, S.W.1. *Tel.:* Sloane 2246.

A series of about 50 titles, 16 mm., Sd. and St., R.; they include:

CALLING ALL DRIVERS, 3 parts, 15, 10 and 10 min. respectively, all 35 mm.; QUICKNESS OF THE HAND, 16 mm., 7 min., C., Sd.; YOUTH TAKES A HAND, 16 mm., 7 min., C., Sd.

Rubber Growers' Association, 19 Fenchurch Street, London, E.C.3. *Tel.:* Mansion House 4463.

A film on the production of LATEX.

J. H. Sankey and Son, Ltd., Aldwych House, London, W.C.2. *Tel.:* Holborn 6949.

SISALKRAFT (1947), preparation and uses, 16 mm., Sd., C., F. to institutions.

Shell Mex and B.P. Ltd., Film Unit, Room 101, Shell Mex House, London, W.C.2. *Tel.:* Temple Bar 1234.

Simmonds Aerocessories, Ltd., 2 Norfolk Street, London, W.C.2. *Tel.:* Temple Bar 2373.

VISION AND FORETHOUGHT, manufacture of accessories, 35 mm., 22 min.

Simpl, Ltd., 1–4 High Street, London, S.E.1. Director, D. C. Stewart.

Singer Sewing Machine Co., Ltd., Singer Building, City Road, London, E.C.1. *Tel.:* Central 7682.

List.—10 titles, 16 mm., St., instructional, F. to colleges and institutions, including: Birth of a Sewing Machine, 5 reels, 75 min.; also a shorter version, 2 reels, 30 min.; A Sewing Machine Lesson, 15 min.; Tucking, 15 min.; Oiling and Cleaning, 10 min.; Darning and Embroidery, 15 min.; Binding, 15 min.; Ruffling, 15 min.; Singercraft, 15 min.; Hemming, 15 min.

Smith, T. J., and Nephews, Ltd., 42 Tavistock Square, London, W.C.1. *Tel.:* Euston 4121.

List.—8 titles, 3 in colour, 16 mm., St., available on occasional loan for medical audiences; including: Uses of Elastoplast in Modern Surgery, M., 90 min.; Functional Treatment of Fractures, M., 90 min.; Plaster Treatment of Tuberculous Hip and Spine, M., 35 min.; Use of Thomas Bed-knee Splint, M., 20 min.; Russell Traction-Hamilton Russell, C., 20 min.; Fracture of the Cervical Spine, M., 35 min.; Treatment of Varicose Conditions and their Complications, C., 60 min.; First Treatment of Industrial Diseases, C., 45 min.

Sperry Gyroscope Co., Ltd., Greta West Road, Brentford, Middlesex. *Tel.:* Ealing 6771.

Films for use in company's own training school.

Timber Development Association, 75 Cannon Street, London, E.C.4. *Tel.:* City 6146.

Library and *List* of films, all on aspects of forestry and timber utilisation, 16 mm., Sd. and St., M., some C., F. to institutions; list includes 8 silent films, and 21 sound films.

Tin Research Institute, Fraser Road, Greenford, Middlesex. *Tel.:* Perivale 4254.

Wonders of Tinplate (Magie du fer Blanc), manufacture of tinplate and its utilisation in the canning industry. (Distributed for Office Technique pour l'utilisation de l'acier.) Sd. and St., F.

Topical Film Co. (*Brent Productions*), North Circular Road, London, N.W.2. *Tel.:* Gladstone 4271.

A series of films (1947) on Woodwork, 16 mm., Sd., 10 min. each, as follows: Forest to Timber Yard; Saws; Care of Saws; Planes; Chisels and Gouges; Boring Tools; Sharpening Tools, etc.; Fixings; Preparing the Wood; Edge Jointing; Setting Out.

Wellcome Research Institution, 183 Euston Road, London, N.W.1. *Tel.:* Euston 4688. Films Officer, Miss F. M. Anthony.

Preparation of Diphtheria Antitoxin and Prophylaxis, a film for medical, nursing and pharmaceutical audiences; the diphtheria bacillus, culture and separation of toxin, preparation of

toxoid, preparation, purification, and testing of antitoxin; prophylaxis—Schick test, testing and injection of alum-precipitated toxoid and toxoid-anti-toxin floccules, 16 and 35 mm., 35 min., Sd., M., F.; Tubocurarin, 16 mm., St., C., 16 min., F.; Stone Age Tools, 16 mm., M., 10 min., F.; Chemotherapy of Amoebiasis, 16 mm., C., 8 min., F.

(4) DISTRIBUTORS.

Board of Trade, German Division, Documents Unit, Cadogan Square, London, S.W.1.

100 Bayer-Leverkusen films from the Wellcome Foundation, chiefly 35 mm., St. or Sd., chiefly in German, some Spanish and English on medical, veterinary and dental subjects.

The British Council, 3 Hanover Street, London, W.1. See p. 123.

British Instructional Films, Ltd., Film House, Wardour Street, London, W.1. See p. 147.

Central Film Library, Imperial Institute, London, S.W.7. See p. 131.

Central Office of Information. See p. 131.

Educational and General Services, Ltd. See Gaumont-British Instructional Library, below.

Gaumont-British Instructional Library, 1 Aintree Road, Perivale, Middlesex. See also Gaumont-British Instructional Ltd., p. 153.

Harris, Ron, 63 King Street, Maidenhead, Berks.

Heaton, Wallace, Bond Street, London, W.1.

National Film Library, British Film Institute, 4 Great Russell Street, London, W.C. See p. 130.

Petroleum Films Bureau, 46 St. James's Place, St. James's Street, London, S.W.1. See p. 157.

Proffitt, R. W., 49–51 Knowsley Street, Bolton, Lancs.

Scottish Central Film Library, 2 Newton Place, Glasgow, C.3. See p. 136.

Timber Development Association, 75 Cannon Street, London, E.C.4. See p. 158.

Framed Constructions; Mortise and Tenon Joints; Carcase Construction; Built-up Materials; Wood Finishes, 2 reels. All sale from makers, film strips in preparation. Technical supervision by R. A. Williams, Shoreditch College, London.

Tomkinsons, Ltd., 6 Terminus Chambers, Holborn Viaduct, London, E.C.1. *Tel.:* Central 2329.

Carpet Making, carpet making by spool and gripper, Axminster, Chenille and Knotted; thought to be the first film on carpet making, 16 mm., St., 1937, lent only for special purpose.

United States Steel Export Co., Ltd., 5 Queen Street, London, E.C.4. *Tel.:* City 5681.

Steel Manufacture (2 films); Golden Gate Bridge Erection; both 16 mm., Sd., F.

United Steel Companies, Ltd., 17 Westbourne Road, Sheffield, 10. *Tel.:* Sheffield 60081.

List.—16-mm. films, M., St., F. to institutions, including: Diamet Inspected Steels, manufacture by high-frequency electric processes, 30 min.; Making of Appleby Plates, 15 min.; Workington Acid Bessemer Steel Rails, manufacture of steel rails from blast furnace to rolling, 15 min.; Workington Hematite Irons, manufacture of iron by machine casting, 15 min.; Mining of Hematite Ore at Beckermet, iron ore mining underground under modern conditions, 15 min.

Walker, William, and Sons, Ltd., Rose Hill Tannery, Bolton, Lancs. *Tel.:* Bolton 5000.

From Hide to Sole, first film in colour on complete process of leather manufacture, and its technical operations, for trade showing; may be available later for occasional loan to scientific societies and others, 16 mm., C., Sd., 34 min.; Mechanised Shoe Repairing (1947), C.

S. Wolf and Co., Ltd., Hanger Lane, London, W.5. *Tel.:* Perivale 5631.

Hands Full of Power, manufacture and applications of Wolf electric tool, 16 mm., C., 25 min.

Wool Industries Research Association, Torridon, Headingley, Leeds, 6. *Tel.:* Leeds 51047.

Processing of Wool, from fleece to fabric; film made for an exhibition some years ago, 16 mm., St., concluding section in colour.

Workers' Film Association, Ltd., Transport House, Smith Square, London, S.W.1. *Tel.:* Victoria 4811.

Maintains a large library on social, economic and scientific topics, including: health, 7 titles; motor cars, 7; biology, 25; agriculture, 10.

(5) PERSONAL DIRECTORY.

Clow, Dr. A., Forces Broadcast Section, British Broadcasting Corporation, Portland Place, London, W.1.

Founder secretary of Aberdeen Scientific Film Club, the first to be formed in Britain.

Cons, Dr. G. J., Geography Department, Goldsmiths College, New Cross, London, S.E.14.

Adviser on geography films to Gaumont-British Instructional, Ltd., and British Council.

Goodliffe, F. A., Box 1150, Salisbury, Southern Rhodesia.

Formerly of Science Films, Ltd.; photography of the SEA URCHIN (Gaumont-British), awarded Medal of Honour, Brussels, 1935; cited 1938 by Royal Meteorological Society as the first professional cinematographer to use time-lapse technique for the analysis of cloud development.

Curthoys, J., 183 King's Road, London, S.W.3.

Documentary film producer and promoter of use of film strip in education; member of Committee for the Preparation and Production of Visual Aids.

Dunlop, Dr. G., Agricultural College, Auchencruive, Ayrshire.

Founder chairman of Ayrshire group of Scientific Film Societies, Scotland; film on VINQUISH IN SHEEP.

Field, Miss Mary, Dominion Theatre, Tottenham Court Road, London, W.C.1.

Initiated with Bruce Woolfe and the late Percy Smith the remarkable series of biological films on cinemicrography and plant life, using time-lapse technique, including those in the SECRETS OF NATURE series (British Instructional), and later the series of SECRETS OF LIFE films (Gaumont-British Instructional).

Elton, A., Film Centre, Soho Square, London, W.1.

Founder chairman of the Scientific Film Association in Britain; scientific films for Shell Oil Co., advisor to Danish Government and Control Commission for Germany on films.

Grayson, Miss Dorothy, B.Sc., Realist Film Unit, 9 Great Chapel Street, London, W.1.

Formerly peripatetic educational organiser for the British Film Institute; chairman, Education Committee of the Scientific Film Association.

Hewer, Dr. H. R., Department of Zoology, Imperial College of Science and Technology, South Kensington, London, S.W.7.

Advised Gaumont British Instructional, Ltd., on many of their biological films, some in conjunction with Dr. Julian Huxley; films include: LIVER FLUKE, EARTHWORM; ANIMALS OF THE ROCKY SHORE; SEA URCHIN; HYDRA; AMOEBA; TORTOISESHELL BUTTERFLY.

Huxley, Dr. Julian, F.R.S., Director-General, UNESCO, 19 Avenue Kléber, Paris.

Advised Gaumont-British Instructional on their zoological films, the first series of didactic scientific films made to meet the necessities of University and advanced school teaching. These films are now classics.

Polanyi, Professor M., Department of Social Studies, University, Manchester.

Money and Unemployment, an animated diagram film produced privately, showing the relation between circulation of money, capital depreciation, savings, and "slumps" as a contributory cause in national instability.

Ilse, Dr. Dora, Medical School, Hospitals Centre, Birmingham, 15.

Butterfly Life, 16 mm., 5 reels, St., R.; 4 reels, without subtitles, showing a scientific study of feeding habits, mating, reproduction, enemies of butterflies; Scenes from Butterfly Life, comprising reel 5 of the foregoing, 500 ft., 16 mm., St., with captions, C.; Experiments on the Colour Vision of Insects, reel 1 and 2, fundamental experiments in training bees to particular colours; reel 3, experiments on colour contrast; reel 4, spontaneous reaction by butterflies to colour, as feeding, drumming and settling reactions.

(6) FILMS.

Tortoiseshell Butterfly, Diplome d'Honneur, Festival International de Cinema, Brussels, 1935; Mary Field, G.-B. Instructional, Ltd.

Amoeba Proteus, Medaille d'Honneur, Festival International de Cinema, Brussels, 1935; Huxley and Hewer, G.-B. Instructional, Ltd.

Face of Britain, Medaille d'Honneur, Festival International de Cinema, Brussels, 1935; Paul Rotha, G.-B. Instructional, Ltd.

Blowfly, Medaille d'Honneur, Festival International de Cinema, Brussels, 1935; G. Fraenckel, G.-B. Instructional, Ltd.

Story of a Disturbance and Hydra, Medaglia della Biennale, Va Mostra Internazionale D'Art Cinematografica, Venice, 1937; G.-B. Instructional, Ltd.

Catch of the Season, Plaque in Class I, Certificate of Merit, Exhibition of Cinematography, Royal Photographic Society of Great Britain, 1937; G.-B. Instructional, Ltd.

Latitude and Longitude, Prix Cidale, Festival Mondial du Film et des Beaux-Arts, Brussels, 1947; Miss Margaret Simpson, G.-B. Instructional, Ltd.

(7) BOOKS.

Albyn Press: *Informational Film Year Book*, Film Focus Press, 1947. 10*s.* 6*d.*

Alexander, D.: *Facts about Films*, Current Affairs No. 5, Bureau of Current Affairs, 1946. 1*s.*

Arts Enquiry and P.E.P.: *The Factual Film*, Oxford University Press, 1947. 12*s.* 6*d.*

Association of Ciné Technicians: *Documentary and Educational Films*, a memorandum for production and use in Post-War Britain, 1938.

Association of Scientific Workers: *Notes on the Formation of Scientific Film Societies*, pamphlet, 1946.

Board of Education: *Optical Aids*, Educational Pamphlet No. 115, H.M. Stationery Office. 1*s.* 6*d.*

British Film Institute: *Choosing a School Projector*, 6*d.*; *Using a School Projector*, 1*s.*; *Teaching with School Projectors*, 1943, 1*s.* 6*d.*; *Report on Science Teaching Films*, 1937, 7*d.*; *Report on Geography Teaching Films*, 7*d.*; *Report on German Educational Films*, 1947, 2*s.* 6*d*; *Memorandum on the Position of Optical Aids in Post-War Education* (prepared for the Board of Trade), 1943, 6*d.*

Buckler, G. H.: *The Mind and the Film*, a treatise on the psychological factors in the film. Routledge, 1926. 5*s.*

British Medical Students' Association: *Guide to Documentary Films on Medical Subjects.* 1*s.*

Burgess, M. A. L.: *Amateur Ciné Movement.* Sampson Low.

Cameron, K.: *Sound and the Documentary Film*, 1947. Pitman. 15*s.*

Donaldson, L.: *The Cinematograph and Natural Science.*

Field, M., and Smith, P.: *Secrets of Nature.* Faber and Faber.

H.M. Stationery Office: *Convention for facilitating the International Circulation of Films of an Educational Character*, Cmnd Paper No. 5155, 1936. 4*d.*

H.M. Stationery Office: *Tendencies to Monopoly in the Cinematograph Film Industry*, 1944. 9*d.*

Industrial Chemist: *The Industrial and Scientific Film*, Oct. 1946, vol. 22. Published by the Technical Press, Ltd., 33 Tothill Street, London, S.W.1.

Jackson-Wrigley, M., and Leyland, E.: *The Cinema.* Grafton, 1939.

McIntosh, D. M.: *Attendance of School Children at the Cinema.* Research Publication No. 1. Scottish Educational Film Association, 1946. 1*s.*

Manvell, R.: *Film.* Pelican No. 126, 1947. 2*s.*

Marchant, J.: *Cinema in Education.* Allen and Unwin.

Meredith, G. P.: *Material for Visual Education. Daily Mail* School Aid Department, London, 1948. 2*s.* 6*d.*

Lauwerys, J. A.: *Film in the School.* Christophers, 1935.

Lindgren, E.: *The Cinema.* English Universities Press, 1945. 4*d.*

P.E.P.: *The Film in Schools.* Pamphlet No. 245, 1946.

Richards, O. W.: *Terminology Proposed for Motion Picture Films.*

Rotha, P.: *Documentary Film.* London, 1939.

Royal Photographic Society (Kinematograph Section): *Guide for Amateur Societies*, 1946.

Royal Photographic Society: *The Presentation of Films:* a Guide to non-theatrical Production, 1946.

Royal Society of Medicine and Scientific Film Association: *Preparation of a Catalogue of Medical Films*, 1946.

Royal Society of Medicine and Scientific Film Association: *Catalogue of Medical Films.* Published by ASLIB, 1948. 7*s.* 6*d.*

Rulon, P.: *Sound Motion Picture in Science Teaching.* Humphrey Milford, Oxford University Press, 1933.

Scientific Film Association: *Place of the Film in Medical Education.* S.F.A., 1946, 1*s.*; *List of Subjects on which Films are wanted by Medical Teachers*, 2*s.*

Scottish Film Council and Scottish Educational Film Association: *Report on General Principles in Production of Educational Films.* University of London Press, 1940. 1*s.*

Spencer, D. A., and Waley, H. D.: *The Cinema Today*, Oxford University Press, 1939.

(8) PERIODICALS.

Amateur Ciné World, Link House, 24 Store Street, London, W.C.1. Editor, G. Malthouse; monthly, 7*d.*

B.K.S. Journal, 2 Dean Street, London, W.1.

Colonial Cinema, Colonial Film Unit, 21 Soho Square, W.1.; quarterly.

Documentary News Letter, Film Centre, 34 Soho Square, London, W.1. Six issues yearly, 6*s.*; occasional articles and news on scientific films.

Educational Film Bulletin, Scottish Educational Film Association, 2 Newton Place, Glasgow, C.3. 6*d.*, twice yearly at present.

Film Forum, Federation of Scottish Film Societies, 6 Hill Street, Edinburgh. Occasional issue at present.

F.D.F.U. Bulletin, Federation of Documentary Film Units, 2 Soho Square. Occasional issue, each issue on a particular aspect of documentary and factual films. Free.

Film Industry, British Film Production, 54 Wardour Street, London, W.1. Monthly; for technicians and studio workers.

Kinematograph Weekly, 93 Long Acre, London, W.C.2.

Look and Listen, 90 Fleet Street, London, E.C.4. *Tel.:* Central 2786. Founded 1947, as a magazine for the modern teacher, containing much technical and didactic material, including factual and scientific information. Publisher, Peter Pound; monthly. 20*s.* yearly.

Miniature Camera World, Link House, 24 Store Street, London, W.C.1. Quarterly.

Monthly Film Bulletin, British Film Institute, 4 Great Russell Street, London, W.C. 6*d.*

Film User, Current Affairs, Ltd., 19 Charing Cross Road, London, W.2. *Tel.:* Whitehall 0841. Editor, B. Dolman. Monthly, 1*s.*

Sight and Sound, British Film Institute, 4 Great Russell Street, London, W.C. Quarterly.

The Mini-Cinema, the Cinema Press, Ltd., 93 Wardour Street, London, W.1. Quarterly, 10*s.* 6*d.* yearly. Editor, L. H. Clark; trade paper for professional 16-mm. film users.

Visual Education Digest, British Instructional Films, Ltd., Film House, Wardour Street, London, W.1. Free.

GREECE

(1) OFFICIAL ORGANISATIONS.

Ministry of Education, Audio-Visual Service (1932), Athens.

Provides schools with films, film strips. Films are 16 mm., St. The formation of a central international cinema library is recommended.

GUATEMALA

No information.

HUNGARY

A Film College is maintained under the Directorship of Victor Gertler; 120 students are now in training.

ICELAND

None.

INDIA

(1) OFFICIAL ORGANISATIONS.

Board of Scientific and Industrial Research, Delhi.

Interested in the use of scientific films.

Indian Institute of Science, Bangalore.

Interested in the use of scientific films.

(2) LEARNED AND PROFESSIONAL BODIES.

Scientific Film Society, Bangalore, c/o Indian Institute of Science (1947). President, Sir J. C. Gosh; Hon. Organising Secretaries, Dr. K. V. Giri, Dr. G. T. Gale, S. Lakshmi Niarasu.

IRAN

No information.

IRAQ

None.

IRELAND (EIRE)

(1) OFFICIAL ORGANISATIONS.

National Film Institute of Ireland, 29 Dame Street, Dublin.

(2) LEARNED AND PROFESSIONAL BODIES.

National Film Institute of Ireland. Secretary, Sean O'Sullivan.

(4) DISTRIBUTORS.

National Film Library, 29 Dame Street, Dublin.

ITALY

(1) OFFICIAL ORGANISATIONS.

Ministry of Public Instruction, section for Educational Cinematography (Ministerio della Publica Istruzione, Cinetecnica Autonomia per la Cinematografia Scolastica), Rome.

Istituto Nazionale Luce, Via S. Susanna 17, Rome.

Cinematographic institution producing films for information on the sciences, arts and natural beauties of Italy.

(3) MAKERS.

Vialpa Company, Rome. Has made scientific and medical films.

(5) PERSONAL DIRECTORY.

Prof. E. Carano, MORPHOLOGIE D'UNE FLEUR.

Prof. F. Delitala, AMPUTATION OF A LEG.

(4) DISTRIBUTORS.

Incom, Via Bellini 27, Rome.

Centro Sperimentale di Cinematografia Educativa, Cremona.

Distribution of films in the schools of the north, for the present only in Lombardy; educational and not specifically scientific.

United States Information Service, Rome.

The British Council, Palazzo del Drago, Via Quattro Fontane 20, Rome.

(6) FILMS.

AXOLOTTI (AXOLOTLS), 35 mm., 250 m.; CHIOCCIOLA (THE SNAIL), 35 mm., 236 m.; FORZA DELLE PIANTE (STRENGTH OF PLANTS), 35 mm., 350 m.; VITA DELLA RANA (LIFE OF THE FROG), 35 mm., 226 m.; LA MOSCA (THE FLY), 35 mm., 302 m.; DALL' UOVO ALLA GALLINA (FROM EGG TO HEN), 35 mm., 462 m.; VITA DELLE API (LIFE OF THE BEE), 35 and 16 mm., 635 m.; ZANZARA (THE MOSQUITO), 35 mm., 342 m.; VITA DELLE PIANTE (LIFE OF PLANTS), 35 mm., 342 m.

JAPAN

No information.

LEBANON

None.

LIBERIA

None.

LUXEMBOURG

(1) OFFICIAL ORGANISATIONS.

National Ministry of Education, Educational Film Office (Office du Film Scolaire), rue du Saint Esprit, Luxembourg ville.

Formed 1945 for the production, distribution and purchase of films and film strip on natural science.

MALTA

No information.

MEXICO

(1) OFFICIAL ORGANISATIONS.

La Cámara Nacional Cinematográfica, Paseo de la Reforma 503, Desp. 408, México D.F.

Twenty Mexican companies have bought 16 mm. projectors specifically to show U.S. films available from the Embassy of the U.S. in Mexico City.

NETHERLANDS

(1) OFFICIAL ORGANISATIONS.

Ministry of Education, Arts and Sciences (Ministerie van Onderwijs, Kunsten en Wetenschappen), The Hague. Dr. N. Vroom, Film Department. Concerned with every aspect of the film in general.

Ministry of War (*Ministerie van Oorlog*) has its own Army Film Service for production and distribution; the Navy and other Government departments are delegating their film services to the care of the Government Information Service.

(2) LEARNED AND PROFESSIONAL BODIES.

Netherlands Scientific Film Institute (Nederlands Instituut voor de Wetenschappelijke Film) 3 Papestraat, The Hague, Telephone 11-03-42.

Set up June, 1948, by the Nederlands Instituut voor Documentatie en Registratuur, to be the national information centre and member of the I.S.F.A. President, Prof. Dr. H. R. Kruyt; Director, Peter Loose.

Netherlands Historical Film Archive (Nederlands Historisch Film Archief), 34 Roetersstraat, Amsterdam.

Films lent to film societies provide revenue. Until recently, concerned chiefly with film as an art, but now interested in scientific films.

Utrecht University will probably set up in 1948 a photograph and films department to serve its laboratories. The initiative came from the faculty of medicine and has the support of all others. For external relations, close co-operation with the Netherlands Scientific Film Institute is planned.

(3) FILM MAKERS.

Netherlands Educational Film (Nederlandse Onderwijs Film).

A semi-official organisation, set up in 1941, for the production and distribution of teaching films.

Several workers in research, teaching and applied science of all levels are making films individually. At the time of printing, no comprehensive list is available. For information, apply Netherlands Scientific Film Institute.

Several private firms are active in production and distribution. None of them is specialised, their main activities being processing, newsreels and entertainment film production and distribution.

(4) DISTRIBUTORS.

There is a project in the Netherlands for the foundation of a University film service, which aims at the production of films for University tuition, and the interchange of these films with foreign Universities.

NEWFOUNDLAND

None.

NEW ZEALAND

(1) OFFICIAL ORGANISATIONS.

National Film Studios, Wellington.

Prior to 1939, some films of a general scientific type were made for the Department of Agriculture. They included: CLOVER, and GROWING OF MALTING BARLEY.

National Film Unit, Wellington, E.4.

Since 1945 the Weekly Review series has included in its items some of scientific interest. These are in the nature of film reports, and have included: The Research Laboratory, the manufacture of contact lenses, scientific workers on White Island, the Chathams and Campbell Island, and the radar-meteorological Canterbury project.

NORWAY

(1) OFFICIAL ORGANISATIONS.

Ministry of Agriculture, Oslo.

Has about 30 films, 16 mm., chiefly silent.

Government Film Board (Statens Filmraad), Oslo (1946).

Promotes production of Norwegian films, including documentaries; the training of technicians; mobile 16-mm. cinemas.

Ministry of Education.

Plans to install projectors in schools, and to train teachers.

(4) DISTRIBUTORS.

Community Film Library (Kommunieres Film Central), 1919.

Provision of school film libraries by sale of films; small loan library of technical films maintained in Oslo. Titles for sale include some 120, all approved by Teachers' Committee.

PAKISTAN

No information.

PALESTINE

No information.

PARAGUAY

No information.

PERU

No information.

PHILIPPINE REPUBLIC

None.

POLAND

(1) OFFICIAL ORGANISATIONS.

Polish State Film Organisation (P.P. Film Polski, 1945, Instytut Filmówy), Warszawa, Marszałkowska 56. *Tel.:* 8–76–90. Acting Director, Wacław Adamiecki.

Founded under Ministry of Culture and Fine Arts; production and distribution of educational, scientific and teaching films, research and scientific study of theoretical problems of the cinema, education of film technicians, promotion of film culture among many classes of population.

Polish Film Institute, a department of Film Polski, produces biological films in its studios at Zyrardow, and agricultural and geographical films at Kraków.

The distribution department of the Institute has 10,000 copies of 250 films, principally silent.

(2) LEARNED AND PROFESSIONAL BODIES.

Scientific Film Institute, University of Łodz (1946) (Pracownia Filmów Naukowych Uniwersytetu Łodziego), Narutowicza 68, Łodz. *Tel.:* 169–71. Secretary, Professor Stefan Bagiński.

(3) FILM MAKERS.

Dr. Stefan Bagiński, Professor of Histology, University of Łodz, Narutowicza 60.

Dr. Tadeusz Dobrowolski, Professor of Ethnography, University of Kraków, Garncarska 5, Kraków.

Karol Marczak, Educational Film Studio (Studjo Filmów Oswiatowych), Zyrardów, Wierzbowa 2. *Tel.:* Zyrardów 55.

Dr. Leszek Pawłowski, Professor of Zoology, University of Łodz, Narutowicza 68. Room No. 35. *Tel.:* 169–71.

(4) DISTRIBUTORS.

Polish Film Institute, Department of Educational Films, Łodz (Instytut Filmowy, Wydział Filmów Oświatowych), Kilińskiego 210.

There is a central library in Łodz, and regional libraries in thirteen of the largest towns in Poland.

(5) PERSONAL DIRECTORY.

Adam Adamiecki, assistant chief manager, Film Polski, Warsaw.

Seweryn Nowicki, Director, Educational Films Department, Polish Film Institute.

Dr. Joseph Zaremba, former director, Polish Film Institute, Warszawa, Fałata 15/4.

(6) FILMS.

WIELICZA (SALT MINES IN WIELICZA); awarded Grand Prix, class of Teaching Films, International Film Festival, Cannes, 1946. Distributed by Film Polski. 35 and 16 mm.

SKROPLONE POWIETRZE (AIR CONDENSATION). Distributed in Poland by Film Polski central distribution office; Łodz, Sienkiewicza 33; for other countries, Warszawa, Marszałkowska 56. 35 and 16 mm.

PORTUGAL

(1) OFFICIAL ORGANISATIONS.

National Propaganda and Tourist Bureau (Secretariado Nacional de Informação, Cultura Popular e Turismo), Rua S. Pedro de Alcântara 75, Lisbon. *Tel.:* 3.2531.

Controls and fiscalises the Portuguese film industry and is authorised to form news and documentary services.

Ministry of Economy, Department of Agriculture, Film Section (Secção de Cinema da Direcção Geral dos Serviços do Ministérioda Economia), Praça do Comércio, Lisbon. *Tel.:* 2.9331. Director, Aldolfo Coelho.

Produces cultural and scientific films on agriculture. *Catalogue* of about 27 films, such as: APICULTURA, 537 m., 20 min.; O MOSQUITO, INIMIGO DO HOMEN (MOSQUITO, ENEMY OF MAN), 462 m., 18 min.

(3) FILM MAKERS.

Octávio Bobone, Rua Sousa Martins 14-rĩc, Esq., Lisbon. *Tel.:* 4.3229.

Jorge Brum do Canto, Rua S. Francisco de Sales 4–1°, Lisbon. *Tel.:* 6.0998. DISEASE OF THE ELM TREE, 35 mm., 200 m. (1935).

J. Adolfo Coelho, Calçada de Santara 198-A, Lisbon. *Tel.:* 4.2939.

Eng° Carneiro Mendes, Rua Braamcamp 42–2°, Lisbon. *Tel.:* 4.8022. MODERN PROCESSES OF MODELLING ANIMALS, 16 mm., 240 m. (1941), made in collaboration with the Laboratory of Dermoplasty, Bocage Museum.

(4) DISTRIBUTORS.

Alvarez, Ltd., Rua Augusta 205–7, Lisbon.

The British Embassy, Lisbon.

The British Council, Rua de Luis Fernandez 3, Lisbon. *Tel.:* 2.9209.

The Canadian Consulate-General, Lisbon.

The Embassy of the United States, Lisbon.

Certain foreign missions maintain film libraries for loan to Universities, schools, and similar bodies.

(5) PERSONAL DIRECTORY.

Dr. Joao Pereira Dias, Professor of Physics, University, Coimbra. Prepared Report on educational films (see below).

Dr. António Sacramento Monteira, Ministry of National Education, Lisbon; film censor and liaison with the British Council in matters of educational films.

(6) FILMS.

Disease of the Elm Tree, 35 mm., 200 m. (1935), do Canto; Silkworm (do Canto); The Carp (do Canto); Black Bass (do Canto); Life of Bombyx Mori, life-cycle of the silkworm, 16 mm., 60 m. (1936); Cresta, gathering honey from the bee-hive, 16 mm., 30 m. (1946), C. (Carneiro Mendes); The Pool, a teaching film, 9·5 mm., 100 m. (1947), (Mateur Jr.).

Other films on scientific topics are planned, but production was suspended because of shortages of material during the war.

(7) BOOKS.

Cinema Educativo, a report on the educational film presented to the Ministry of Public Instruction. Imprensa Nacional, Lisboa, 1935.

(8) PERIODICALS.

None at present; two periodicals which have now ceased publication—*7a Arte* and *Objectiva*—contained material from time to time on educational films.

RHODESIA

(1) OFFICIAL ORGANISATIONS.

Public Relations Department, Salisbury, Rhodesia.

Leaves from a Doctor's Notebook, made in co-operation with the Department of Health, destruction of the Bilharzia snail; a story built around a family whose children contract Bilharzia. 35 mm., 20 min., 1947; scientific version is Schistosomiasis, life-cycle of the Bilharzia parasite, penetration into skin, and hatching of the eggs.

RUMANIA

No information.

SALVADOR

No information.

SAUDI ARABIA

None.

SOUTH AFRICA

(1) OFFICIAL ORGANISATIONS.

Film Services Division, Union Education Department, Government of the Union of South Africa, Impala House, Prinsloo Street, Pretoria, P.O. Box 1146.

Main functions are: (i) distribution of educational films to schools, Universities and adult educational institutions, and (ii) production of documentary, scientific and educational films for State and semi-State departments.

(2) LEARNED AND PROFESSIONAL BODIES.

No organisation specifically interested in scientific films solely, but several organisations exist which are interested in films and film-making; these range from the amateur and social type to those seriously interested in the scientific and artistic evolution of the film. These latter include:

Johannesburg Amateur Ciné Club, 11 Elray Street, Raedene, Johannesburg.

Johannesburg Film Society, c/o Box 5463, Johannesburg.

National Union of South African Students.

In the course of a current survey of the effect of the Banut way of life on health, a film is being prepared, for showing at the Union's forthcoming conference in 1948.

University of Cape Town Film Unit. Address the Director, University Film Unit, Administrative Building, Lovers Walk, Rosebank, Cape.

Pretoria Ciné Club, 11 Finsbury Court, Church St., Pretoria.

(3) FILM MAKERS.

Film Services (see (1) above).

African Film Productions, Ltd., Killarney, Johannesburg.

Occasional films of a popular nature for commercial distribution, made under the sponsorship of various scientific institutions.

(4) DISTRIBUTORS.

Film Services (see (1) above).

Department of Defence. Maintains a small library of films on military training and military science.

(5) PERSONAL DIRECTORY.

Dr. P. J. Du Toit, Director, Onderstepoort Veterinary Research Laboratory, P.O. Onderstepoort, Transvaal.

Has made use of the facilities of Film Services for the production

of scientific films, in conjunction with his colleagues: Dr. J. Quin (Physiology), Dr. Clark (Physiology) and Dr. R. du Toit (Veterinary Entomology).

Dr. A. Pijper, University of Pretoria.

Has made films on microbiology, including the following: ACTION OF BACTERIOPHAGE ON TYPHOID BACILLI, changes in motility, membrane structure, formation of blue bodies, and collapse of bacteria; St., with sub-titles in Afrikaans and English. VI AGGLUTINATION, effect of the addition of Vi anti-serum to suspensions of motile typhoid bacilli; St., sub-titles in Afrikaans and English; BACTERIAL SHAPE AND MOTILITY, 60 min., St., sub-titles in English; a demonstration of motility in organisms without flagella, and an exposition of the formation of flagella during motion of bacteria, from the membrane micellae.

Major-General R. Palmer, Commissioner of Police, Pretoria, is making increasing use of scientific film in his department, for training purposes.

(6) FILMS.

NAGANA, Trypanosomiasis in animals, 16 mm., C., 1,200 ft. (Film Services); NUTRITION OF RUMINANT ANIMALS, 16 mm., C., 1,000 ft., Onderstepoort Veterinary Research Laboratory; FOOT AND MOUTH DISEASE, 16 mm., C., 400 ft. (Film Services); DENTAL CARIES, 16 mm., C., 400 ft., St. (Film Services); SOIL EROSION; PRODUCTION OF HIDES AND SKINS IN SOUTH AFRICA.

SPAIN

(1) OFFICIAL ORGANISATIONS.

Ministry of Agriculture, Motion Picture Division, Velasquez 59, Madrid. *Tel.:* 25.92.83. Director, El Marqués de Villa Alcazar.

Makes educational films, 35 mm., in agriculture, forestry and animal husbandry; distribution in Spain to cinemas by a leading commercial distributor.

Instituto de Investigaciones y Experiencas Cinematograficas, Madrid. Director, V. Lopez Garcia. Training centre for technicians.

Ministry of Public Works, Madrid. Documentary films on waterfalls, hydro-electric plant.

Admiralty, Madrid. Training and information films.

(3) FILM MAKERS.

Admiralty.

(i) Made in collaboration with Cifesa: THE NAVY CALLS YOU, training of volunteers; EXPERIMENTAL CANAL, hydrodynamic

experiments at El Pardo, 500 m.; HORIZONS OF GLASS, methods of putting model boats into glass bottles, 350 m.; THE ARTILLERY POLIGON, tests and proving of guns and projectiles at Cadiz, 600 m.; NAVAL MUSEUM: SHIPS UNDER REPAIR, repair docks at La Carraca, 600 m.; DIARY OF A MARINE, in the training ship *Juan Sebastian Elano*, 600 m.

(ii) Made in collaboration with "Nodo": TORPEDOES, mechanism and management, 300 m.; SUBMARINE MINES, handling of mines, methods of sweeping, 300 m.; TORPEDO-BOAT CREWS, educational and popular, 450 m.

(iii) Produced by the Admiralty: SALVAGE OF SHIPS, 1,200 m.; BY SEA AND LAND, educational and popular account of life in the marines; a commando attack on a beach.

Cifesa. See above.

Ministry of Agriculture, Départemento de Cinematografia.

SEMILLAS (SEEDS), selection and disinfection of seeds; ABONOS (FERTILISERS); BARBECHO (FALLOW PLOUGHING); SEDA EN ESPANA (SILK IN SPAIN); BOSQUES AMIGOS (FRIENDLY FORESTS), reforestation; EL CORCHO (CORK), production, harvesting and uses of cork, Spanish and English commentaries; JEREZ-XEREZ (SHERRY), origin of various sherry wines, specific yeasts, English and Spanish commentaries; REPOBLACION FORESTAL (REAFFORESTATION), control of erosion, dunes, and deforestation, English and Spanish commentaries; LANA DE ESPANA (WOOL FROM SPAIN), merino wool, care of flocks, Spanish and English commentaries; TRIGO EN ESPANA (WHEAT IN SPAIN), cultivation, genetic selection and hybridisation; TABACA EN ESPANA (TOBACCO IN SPAIN), tobacco curing, cigar and cigarette manufacture; ALGODON EN ESPANA (COTTON IN SPAIN), cultivation of cotton, and thread-making; MADERAS DE ESPANA (WOOD FROM SPAIN); INDUSTRIAS LACTEAS (MILK INDUSTRIES); ESCARABAJO DE LA PATATA (THE POTATO BUG, COLORADO BEETLE); OLIVOS DE ESPANA (SPANISH OLIVE TREES); ESPARTO DE ESPANA (ESPARTO GRASS); DATILES Y PALMAS (DATES AND PALMS), made in Spain and in California, English and Spanish commentaries; CARICIAS A LAS NARANGAS (CARE OF ORANGE CROPS), Spanish and English commentaries.

The foregoing were made under the Marquis of Villa Alcazar's direction.

Noticarias y Documentales ("Nodo"), official newsreel organisation.

Special School of Industrial Engineering, Madrid.

PRACTICAL WORK IN THE METALLURGICAL LABORATORY, a micrographical study of a broken lever; NATIONAL EXHIBITION OF THE ELECTRICAL INDUSTRY, 1945, a news film on the Industrial Exhibition held by the Electrical industry.

(5) PERSONAL DIRECTORY.

El Marqués de Villa Alcazar. Film work for twelve years in California, later, Head of Publications Department of the Ministry of Agriculture, and developed the Departmento de Cinematografia, producing many technically outstanding films on agriculture (see above).

SWEDEN

(2) LEARNED AND PROFESSIONAL ORGANISATIONS.

Department of Visual Instruction, Royal Institute of Technology, Stockholm, 26. *Tel.:* 31.45.24. Secretary, Erland Liljeström.

(3) FILM MAKERS.

A.B. Europa Film, Kungsgatan 24, Stockholm. Secretary, Educational Film Department, Bertil Edgren.

Two scientific films: REMOVAL OF PARASAGITTAL MENINGOMA, a medical educational film describing a brain operation executed by Dr. Herbert Olivecrona at the Serafimerlasarett (1946); 16 mm., St., C., S., 303 m.; RESECTION OF THE AORTA FOR COARCTATION, describing an operation by Docent Clarence Crafoord at Stockholm, 16 mm., St., 303 m., C., S.

A.B. Kinematografiska Anstalten, Riddargatan 23B, Stockholm. Specialise in military sciences.

A.B. Sandrew-Ateljéerna, Lästmakaregatan 18, Stockholm.

Master-Film, Björnelunda. *Tel.:* Bjornelunda 77.

A.B. Svensk Filmindustri, Kungsgatan 36, Stockholm. Director, Education Division, Christian Tenow (see (5) below).

(4) DISTRIBUTORS.

A.B. Europa Film, Kungsgatan 24, Stockholm.

Filmo-, Folkrörelsernas Filmorganisation, Saltmätaregatan 8A, Stockholm.

Armé, Marin- och Flygfilmföreningen, Riddargatan 23B. Films in military science only.

A.B. Svenskfilmindustri, Kungsgatan 36, Stockholm.

Catalogue: Jubileumscatalogue (1947) is a fully documented list of over 1,000 titles, chiefly scientific; some 70 pages are devoted to educational films in geography, industry, agriculture, zoology, botany, astronomy, physics and chemistry.

The sources of these films are world-wide, and represent a collection of outstanding Swedish and other films.

(5) PERSONAL DIRECTORY.

Professor Alfred Liljeström, Professor of Applied Mathematics, and Director, Department of Visual Instruction, Royal Institute of Technology (Kungl. Tecniska Högskolan), Stockholm 26.

Christian Tenow, Educational Director, A.B. Svenskfilmindustri, Kungsgatan 36, Stockholm.

(6) FILMS.

Medical.—Removal of Parasagittal Meningoma; Resection of the Aorta for Coarctation (Europa Film).

Mathematical.—From Abacism to Modern Computing; Circular and Hyperbolic Functions; Elliptic Functions; Differential Equations of the First Order (Master Film).

(7) BOOKS.

Einar Förberg: *Selling with Films* ("Att sälja med film"). Deals with the film in commerce and industry. Published by Affärsekonomi, Stockholm, 1946. Kr. 16 (paper), or Kr. 20 (bound).

(8) PERIODICALS.

Swedish School Film and Documentary Film (*Svensk Skolfilm och Bildningsfilm*). Editor, Christian Tenow; published by A. B. Svenskfilmindustri. Free.

SWITZERLAND

(1) OFFICIAL ORGANISATIONS.

Swiss Film Chamber (Schweizerische Filmkammer), Länggastr. 8, Bern. *Tel.:* 031/2.62.08.

General enquiries on Swiss films are dealt with; a catalogue of films is being compiled.

Swiss Working Union for Educational Cinematography (Schweiz. Arbeitsgemeinschaft für Unterrichtskinematographie), Photo-graph isches Institut der Eidgenossischen Technische Hochschule, Zürich, Sonneggstr. 5. *Tel.:* 051/32.73.30.

(2) LEARNED AND PROFESSIONAL BODIES.

Swiss Cinema for Schools and the People (Schweiz. Schul- und Volkskino), Erlachstr 21, Bern. *Tel.:* 031/2.70.49.

Schweiz. Arbeitsgemeinschaft. (See (1) above.)

Institut Fédéral de Cinématographie Scientifique, 18 Place Cornavin, Geneva (1947). Hon. President, Prof. Maurice Lugeon; Chairman, Ed. J. Sallaz; Secretary, I. Eggenberger.

(3) FILM MAKERS.

Condor-Film, Ltd., Forchstr 2, Zürich. *Tel.:* 051/32.56.50.

Iris-Film, Ltd., Freudenbergstr. 132, Zürich. *Tel.:* 051/26.76.23.

Kern-Film, Ltd., Innere Margarethenstr. 19, Basel.

Swiss Cultural Film, Ltd. (Schweizerische Kultur-Film A.G.), Freudenbergstr. 132, Zürich. Director, Rodolphe Meyer.

Formed recently to give an opportunity for production of Swiss films for international use, including scientific films. In preparation, LE VOILE BLANCHE, under direction of Dr. Nicholas Kaufmann.

(4) DISTRIBUTORS.

Columbus-Film, Ltd., Pelikanstr. 37, Zürich. *Tel.:* 051/27.10.30.

Schweiz. Filmarchiv (Swiss Film Library), Stapfelberg 7, Basel. *Tel.:* 061/4.59.05. Secretary, H. Goldschmidt.

(5) PERSONAL DIRECTORY.

Dr. Heinrich Fueter, Director, Condor-Film, Ltd.

Dr. Nicholas Kaufmann, Iris-Film, Ltd.; formerly chief of Cultural Film Division of UFA.

Dr. Hans Noll, Director, Kantonale Lehrfilmstelle, Rheinsprung 21, Basel.

(6) FILMS.

DIE BILDSPENDENDE FLUSSIGKEIT—LE LIQUIDE IDOPHORE. Film on ciné-television acquired by Prof. Dr. F. Fischer, Institut für Technische Physik, Eidg. Techn. Hochschule, Zürich. German and French versions, 35 mm., Sd., 800 m.

KAMPF DEM KREBS—LA LUTTE CONTRE LE CANCER—FIGHT AGAINST CANCER, German, French and English versions, 35 mm., Sd., 1,800 m.; world distribution: Intercontinentale Filmvertriebs, Ltd., Pelicanstr 37, Zurich.

DER WEG ZUR UNSIGHTBAREN WELT—THE WAY TO THE INVISIBLE WORLD, German, English, French, Spanish and Portuguese versions, 35 mm., Sd., 520 m.; distribution: Eric B. Weissenberg, Viktoriastr. 32, Bern.

(8) PERIODICALS.

Schweizer Film Suisse, Weinbergstr. 11, Zürich.

The only periodical specially concerned with films; the professional journal of Swiss kinematography.

TASMANIA

(1) OFFICIAL ORGANISATIONS.

State Library, Hobart. Exhibits documentary films.
Education Department, Hobart. Uses educational films.

TURKEY

No information.

UNION OF SOVIET SOCIALIST REPUBLICS

(1) OFFICIAL ORGANISATIONS.

Ministry of Cinematography, Mali Gnezdnikovski Peryolok, Moscow. *Tel.:* KO 2100.

At the head of all film production of the U.S.S.R. Scientific and Documentary Film Studios are under the jurisdiction of the Chief Administration for science and educational films in the Ministry.

This chief administration appoints directors and chief editors of the scientific and documentary film studios, and endorses plans and films released. Each studio has a Director, assisted by a Chief Editor and an Arts Advisory Council consisting of the leading workers of the studio and representatives of science and culture. At the beginning of each year, each studio draws up its plan with due regard to commissions received from the Films Committees of the Ministry of Health, the Educational Films Department of the Ministry of Education, the Ministry of Defence, etc.

Each studio has a Science-Methodics Council, with members drawn from many fields of activity. This Council is responsible for supervision and co-operation. Films when ready for release are viewed and discussed by the Chief Council, consisting of many prominent Academicians, professors and film directors. The Chief Council is headed by the Vice-President of the Academy of Sciences.

Catalogue.—Popular-scientific and Technical Instructional Films now in Use, pub. Goskinoizdat, Moscow, 1944, 14 roubles. Editor, V. A. Fridman.

(2) LEARNED AND PROFESSIONAL BODIES.

See (1) and (3).

(3) FILM MAKERS.

Five studios for documentary and scientific films, at Moscow (two), Leningrad, Kiev and Novosibirsk:

All-Union State Institute of Cinematography, Pl. V.S. Kh.V., ul Textilstichov 1 B., Moscow.

Institute of Film Engineering, Krasnoarmeyskaya 13, Kiev.

Institute of Film Engineering, Ul. Pravdy 13, Leningrad.

Laboratory for Scientific Applied Photography and Cinematography, M. Kharitnovsky per. 4, Moscow.

(4) DISTRIBUTORS.

The distribution of scientific and other films is highly centralised, chief control being exercised by the Ministry of Cinematography in Moscow, through the Ministries of Cinematography of the other parts of the U.S.S.R. (White Russia, Ukraine, Georgia, etc.).

Each town, county ("oblast") and country district has its own Scientific Film Distribution centre, the system operating in somewhat the same way as the Public Library system in Britain, so that an application for a particular film made to a country district centre will be forwarded if necessary right through to the Ministry of Cinema in Moscow.

All scientific films are thus in theory available for showing in even the most remote part of the country.

(5) PERSONAL DIRECTORY.

Dolin, Boris, LAW OF GREAT LOVE (1945).

Galkin, N., ABORT (1940), a medical film.

Gorgolav, Professor S., four films, including POINTS IN URGENT TRAUMATOLOGY (1935).

Schneiderov, Vladimir, GOLDEN LAKE (1935).

Vinnitsky, Andrei, ANTS AND AMAZON ANTS (1935).

Yudin, Prof. Sergei, Military Technical Film Studio. ARTIFICIAL OESOPHAGUS (1939); ACUTE APPENDICITIS (1938); ACUTE INTESTINAL OBSTRUCTION (1938); TREATMENT OF FORE-ARM FRACTURES (1938-40).

Zguridi, A., THE FORCE OF LIFE (1941); DEPTHS OF THE SEA (1938); IN THE SANDS OF CENTRAL ASIA (1942).

(8) PERIODICALS.

Iskusstvo Kino, the only periodical at present dealing exclusively with films, both feature and documentary. Editor, N. K. Semenov; published by Ministry of Cinema, monthly, 10 roubles.

In addition, a number of other periodicals publish from time to time articles on cinema, including scientific-documentary films:

Literaturnaya Gazeta. Editor, V. Ermilov; published by directorate of Union of Writers, Ul. 25 October 19, Moscow. Weekly, 50 kopecs.

Ogonyok. Editor, A. Surkov; published by *Pravda*, U 1. Pravda, Moscow. Weekly, 3 roubles.

Sovietskoe Iskusstvo. Editor, V. Vdovichenko; published by Ministry of Cinematography; Committee of Artistic Affairs; Committee of Architectural Affairs, Pushkinskaya 19, Moscow. Weekly, 45 kopecs.

Sovietskoye Studenshestvo. Editor, A. Lipatov; published by Central Committee of Communist Party, Sushevskaya 21, Moscow. Monthly, 2 roubles.

Smena, published by Central Committee of Communist Party, Ul.Pravda 24, Moscow.

Znanya-Sila. Editor, A. F. Bordadyn; published by Ministry of Labour Reserves, Rozhdestvenka 4, Moscow. Monthly.

Articles of scientific and other films are also published regularly in most of the leading daily papers, including *Pravda* and *Isvestia*. *Nayuka i Kino* (*Science and Films*), a monthly brochure on scientific films, is shortly to be published by VOKS, Cinema Section.

UNITED STATES OF AMERICA

(1) OFFICIAL ORGANISATIONS.

American Museum of Natural History.

PARICUTIN, the story of a volcano which in 1943 originated in the fields of a Mexican farmer, and has now grown to a 1,300 ft. cone, with jet of powdered rock and steam 30,000 ft. high; the only volcano to have been observed from the beginning by geologists; some pictures taken by helicopter, others inside the crater, others of the gradual desolation of San Juan with its population of 5,000. In colour.

Department of Agriculture, Washington, D.C.

Agricultural films made in recent years distributed by Castle Films, Inc. (see p. 193).

Office of Education, Division of Visual Aids, Washington, D.C. Director, E. Floyd Brooker.

Films recently made include a series on electronics, as parts of visual teaching units: THE ELECTRON, 16 min., the electron, electricity and magnetism; THE DIODE, 18 min., applications of the diode, including the photo-electric cell and X-ray tubes; THE TRIODE, 18 min., diagrammatic exposition of structure and working; PRINCIPLES OF GAS-FILLED TUBES, 15 min.

Department of Commerce, Office of Technical Services, Washington 25, D.C.

Has 5,000 reels of microfilm of data received from Germany on preparation and production of chemicals, including flow sheets, plant design and physical and chemical data. Apply to R. Weiss.

Department of Interior, Washington, D.C.

The Building of Bonneville Dam, 30 min.

Navy, Washington, D.C.

Recent films are distributed by Castle Films, Inc. (see p. 193); they include: Operation Crossroads, official record of the Bikini tests on the atomic bomb, 26 min., C., Sd.; Film Tactics, an instructional film on the rationale, use, preview and projection of films for teaching, 16 mm., Sd., 22 min.; Crash Fire Rescue, 35 and 16 mm., Sd.; Safety in Air Stations, 35 and 16 mm., Sd.

Bureau of Mines, Motion Picture Section, Central Experiment Station, 4800 Forber Street, Pittsburg 13, Pa. Director, James Boyd.

Maintains a loan library of films for distribution to training centres, scientific societies and comparable organisations. Production programme includes series on mining, minerals and petroleum; in co-operation with the mineral industries of U.S.A., copies of films made by the latter are made available in their library. Films include:

Study of Texas and its Natural Resources; Oklahoma (in production); California (in production); Ohio (1948); Drama of Steel; five films on Aluminium, Fabrication of Copper; Story of Gasoline (in preparation); Story of Lubricating Oil (in preparation); Sulphur (1947), production operations and utilisation of sulphur; sponsored by the Texas Gulf Sulphur Co., 16 mm., Sd., 20 min.

Department of Public Relations, Washington, D.C.

Doctor in Industry.

Library of Congress, Washington, D.C. Director, Motion Picture Project, John G. Bradley.

The library proposes to preserve a considerable library of motion pictures, comparable in its province to printed documents; one section is to be devoted to factual film, particularly that on 16-mm. stock. The annual intake is estimated at some 300 titles, or 150,000 ft.

It is also proposed to develop a catalogue of extant films, and of relevant literature. (*Journ. Soc. Motion Picture Engineers*, 47, 63–72, 1946.)

Veterans' Administration, Washington, D.C.

Published *A List of Medical Films which may be used in Professional Training*, 1947.

(2) LEARNED AND PROFESSIONAL BODIES.

Allan Hancock Foundation for Scientific Research, 7024 Melrose Avenue, Los Angeles.

Films made during scientific expeditions of the Foundation include Colourful Latin America, 16 mm., C.; To Tropic Seas; Birth and Education of a Seal; Tropical Birds, and

ELEPHANT SEALS OF GUADALUPE ISLAND. Copies available at cost of print, to recognised educational and scientific groups.

Allied Non-theatrical Film Association.

American Chemical Society, 1155 16th St., N.W., Washington, 6, D.C. Published *Films on Chemical Subjects*, listing 400 films (1947).

American Cancer Society, New York City.

THE TRAITOR WITHIN (1947), describes symptoms of cancer, 16 mm., Sd.

American College of Surgeons, 40 East Erie St., Chicago 11, Ill.

The Committee on Medical Motion Pictures has a programme for assembling information on, and evaluating medical films. Films received are reviewed by subject specialists, and the teaching value of the films assessed. Those which satisfy the professional, didactic and photographic standards of the College are authorised to carry a legend to that effect.

The College does not maintain a loan library, but has assembled a list of medical motion picture films (*Bulletin of the College*, pp. 1–44, 1946); the list is classified by subjects, gauge, length and source being given. The College has sponsored two sound motion pictures: R.N.—SERVING ALL MANKIND, on nursing; and WHITE BATTALIONS, on hospitals. Both films were made under a grant from the Becton Dickinson Foundation.

From 1940 onwards, through the Division of Cultural Relations of the U.S. Department of State, a programme of lending films to Latin America was maintained. In 1942 and thereafter, 26 film subjects were selected for sending to China; and films have also been distributed to Australia, Britain, Egypt, India, Iran, Portugal, Sweden, Syria, Spain, New Zealand and South Africa.

In 1945 an expanded programme was approved by the Board of Regents, and, under a grant from the Johnson and Johnson Research Foundation, plans for production, appraisal and establishment of a film library are now in hand. The list of approved titles referred to above, includes some 800 films, such as those made by the Medical Department of the U.S. Army, and the Bureau of Medicine and Surgery of the U.S. Navy; it also includes some titles suitable for showing to lay audiences.

American Council on Education, 744 Jackson Place, N.W., Washington, 6, D.C.

Film Strip List (1946), 39 titles in the Series "Life in the United States", chiefly regional geography, steel, railway transportation; film strips chiefly 40–50 frames, St., including two copies of script.

Publications.—Several brochures on Films in Education.

Chicago Scientific Film Society, 84 East Randolph Street, Chicago, Ill.

The purpose of the Society is to present each year the new

scientific films on such subjects as biology, physics, chemistry, medicine, astronomy, industrial processes, and in related fields.

Elizabeth Kenny Institute, Minneapolis, U.

POLIOMYELITIS, a factual report of the Kenny treatment in cases of infantile paralysis. 16 mm.

Film Counsellors, New York City.

Specialised advisory service for films for training.

Film Council of America, 6 West Ontario Street, Chicago, Ill. Executive Director, Thurman White.

Encourages the production and distribution of audio-visual aids, and is organising a nation-wide drive to this end. Film Councils are being formed in 66 centres, including Michigan, Ohio, Indiana, Texas and Wyoming; there are four in Iowa. Dr. Stephen Corey, Educational Psychology Department, University of Chicago, is interested in these developments.

Institute of Visual Training, 40 E. 49th Street, New York 17.

Los Angeles City Bureau of Water and Power, Calif.

THE CONSTRUCTION AND INSTALLATION OF STONE INLET AND OUTLET PIPE LINES, the fabrication of pipe from cold rolled steel, electrically welded, the grit blasting of pipe, and coating with hot coal tar primer and enamel. 16 mm., M.

Medical Film Guild, 167 West 57th Street, New York, 19, N.Y.

Under the direction of Joseph P. Hackel, surgical operations are filmed, using the specially devised compact cameras, and small mirrors and lamps; this technique has been applied to the neurosurgical operations of Dr. R. Klemmo.

Film library thus built up includes films on BLOOD-VESSEL SURGERY, PLASTIC SURGERY, TRANSPLANTATION OF THE CORNEA and TREATMENT OF THE MAJOR NEURALGIAS. All 16 mm., Sd., some with sound tracks in Portuguese, French, Spanish and Italian. F.

National Cotton Council, New York.

Has produced, in co-operation with the American Soybean Association, a film PROGRESS IN PRODUCTS, which shows development in utilisation of raw materials, particularly in the margarine and textile industries. 16 mm.

New York Botanical Gardens, Bronx Park, New York City.

FOOD SYNTHESIS BY GREEN PLANTS, shows how green plants manufacture sugars within their cells; illustrated by scenes in Florida and California. 20 min., C., Sd.

Rutgers Films, Box 78, Rutgers University, Department of Biophotography, New Brunswick, N.J.

The Department of Biophotography was established in 1938 in the College of Arts and Sciences; it uses the motion picture camera for teaching and research; its films are used by about 100 schools,

Colleges and Universities in the U.S.; they are intended to illustrate and supplement textbook material.

Catalogue No. 6 includes some 30 titles, all 16 mm., several in serial parts. They include: Invertebrates from the Gulf of Maine, M., St., 2 reels, each 400 ft.; The King Crab, Limulus, 400 ft., M., St.; Colour Changes in Fish and Squids, 380 ft., V., St.; Colour Changes in Frogs and Crustaceans, 425 ft., M., St.; Coelenterata and Ctenophora, 2 reels, each 400 ft., C., St.; Annelida, 2 reels, each 400 ft., C., St.; Echinodermata, 2 reels, each 400 ft., C., St.; Arthropoda, barnacles, lobsters, shrimps and other crustacea, 2 reels, each 400 ft., C., St.; Mollusca, reel 1, a nudibranch, a snail, bivalves, a scallop and a squid, 400 ft., C., St.; reel 2, *Aeolis* and *Elysia*, 350 ft., C., St.; Gulf of Mexico Invertebrates, 2 reels, each 400 ft., C., St.; A Parade of Invertebrates, 4 reels, each 400 ft., C., St., illustrating representative invertebrates of the major groups.

Marine Communities, 400 ft., C., St.; Pelican, Turtle and Fish, Gulf Coast of Florida, 400 ft., C., St.; Blood Circulation in Marine Animals, 400 ft., C., St.; Marineland, the oceanarium of Marine Studios, underwater shots of porpoises, sharks, loggerhead turtles, pelicans and cormorants, 800 ft., C., St.; Dwellers of Swamp and Pond, reel 1, salamanders, 400 ft., C., St.; reel 2, frogs and toads, 400 ft., C., St.; Mineral Deficiencies in Plant Growth, effects of deficiencies on plant growth, time-lapse photography magnifying movement of plants up to 8,000 times, 1,200 ft., M., St. or Sd.; Movements of some Common Plants, 400 ft., M., St.; Time Lapse Studies of Flowers, 350 ft., C., St.; Cellulose Decomposition in Nature, 800 ft., M., St.

The Story of Appendicitis, appendicitis from the layman's point of view, 800 ft., C., St.; Benign Tumours of the Uterus, for medical men and advanced students, 400 ft., C., St.; Electro-Shock Therapy in Ambulatory Practice, for physicians and psychiatrists, 350 ft., C., St.; Mental Child Development, genetic study of a child from 28 months to 63 months, 800 ft., C.; Mental Defectives, 800 ft., C., St.

All these films may be rented or purchased.

Smithsonian Institute, National Museum, Washington, D.C. Curator of Photography, Dr. J. A. Olmstead.

Universities.

Many Universities maintain departments concerned in varying degrees with the scientific aspects of film making and use. They include the following:

Departments of Audio-Visual Aids.

Cornell, Department of Extension Teaching and Information,

Ithaca, New York; Brooklyn College, New York; University of Michigan, Ann Arbor; Pennsylvania State College; University of Wisconsin, Extension Division, Madison 6, Wisconsin; University of Oklahoma, Norman, Okla.

Departments on Film or Cinema.

University of Denver, Colorado, motion picture making; New York University, Department of Motion Pictures, Washington Square, New York, 3, N.Y.; University of Southern California, Department of Cinema, 3551 University Avenue, Los Angeles, Calif., degrees of the University granted (A.B. and M.A.), with major in cinema.

Yale Bureau of Highway Traffic, New York.

By the use of film, the Bureau has analysed traffic at cross-roads, and with statistical treatment of the results, have arrived a formula for prediction of probable movement of free-flowing traffic.

(3) FILM MAKERS.

Aetna Casualty and Curety Co., Hartford, Conn.

LIVE AND LET LIVE, a safety educational film in 3-dimensional animation.

Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh, Pa.

MELTING OF HURON STEEL, 16 mm., C., 15 min., F.; CORROSION, development of stainless steels.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

MAGIC OF STEAM, 18 min.; METAL MAGIC, various uses of induction heating, 16 mm., St., C., 12 min.

American Film Producers, Empire State Building, N.Y. Executive Directors, L. A. Glesnes, R. Gross.

Production of commercial, industrial, training and educational films.

American Plant Food Council, Inc., 817 Barr Building, 910 17th Street, N.W., Washington 6, D.C.

FIRST IN THE HEARTS OF FARMERS, an account of the search for new fertilisers, 1947, 16 mm., Sd., 24 min., F.

American Structural Products Co., Toledo 1, Ohio.

WALLS OF DAYLIGHT (1948), the use of sulux glass blocks in construction, 16 mm., Sd., F. to suitable organisations.

American Viscose Corporation, New York.

SCIENCE SPINS A YARN, a film for school curricula, on the development of rayon, and for informing users, two reels, C.

Ampco Metal Inc., 1745, S. 38th Street, Milwaukee, 4, Wis.

GOLDEN HORIZONS, discovery and development of copper base alloys, 16 mm., 33 min., C.

Arabian American Oil Co. (Aramco), New York.

DESERT VENTURE, an account of American enterprise in oil industry in Saudi Arabia, 800 ft., 16 mm., C.

Armour and Co., Audio-Visual Promotion Department, Union Stockyards, Chicago, Ill.

Automobile Manufacturers' Association, New York.

HORIZONS UNLIMITED, development of road transportation in the United States, and its economic importance. 16 mm., Sd., 17 min., distributed F. by National Highway Users Conference, Film Department, 938 National Press Building, Washington 4, D.C.

Babcock and Wilcox, New York.

STEAM POWER FOR AMERICAN SEA POWER, 16 mm., Sd.

Bakelite Corporation.

SCIENCE SAVES THE SURFACE, 20 min.

Bemis Bro. Bag Co.

THE KING'S OTHER LIFE, history of cotton, uses of printed bags in rural areas.

A. M. Byers and Co.

ETERNALLY YOURS, manufacture of wrought iron, 30 min.

Canada Dry Ginger Ale Inc., 221 La Salle, Chicago, Ill.

NATURE'S VINTAGE, an account of the processes in growing grapes, collection, crushing and fermentation, 1945, 16 mm., 25 min., Sd., C., F.

Carnegie-Illinois Steel Corporation, Industrial Relations Department, Pittsburgh, Pa.

HIGH-BALLING, a sound slide-film showing methods of moving freight, efficient loading and unloading, cranes, tractors and equipment.

Carvel Films, Inc.

Calco (Chemical Division), American Cyanamid Co., New York.

PORTRAIT OF AN INDUSTRY, the development of dyes, 33 min., C.
IT'S ALL IN THE FINISH, various new finishes to textiles, to control shrinkage of wool, resist creases and stabilise fabrics, 16 mm., C.
STORY OF AN ORE SAMPLE, 16 mm.

Champion Spark Plug Co., Toledo, Ohio.

IGNITION AND SPARK PLUGS.

Corning Glass Works.

GLASS FOR INDUSTRY, uses of glass, 25 min., C.

Coronet Instructional Films, 919 North Michigan Avenue, Chicago 2, Ill.

Educational films include: HOW MAN MADE DAY, development of sources of light, 1 reel, Sd., MATTER AND ENERGY, physical and chemical changes, law of conservation, 400 ft., 16 mm., C. and M.

Cross Machine Co., Detroit, Michigan.

TOOLS FOR PROFIT, 30 min., 16 mm., Sd., distributed by Hathen Productions (see p. 194).

Dow Chemical Co.

TREASURES FROM THE SEA, extraction and uses of magnesium from the sea; distributed by Princeton Film Centre.

Eastman Kodak Co., Rochester 4, N.Y.

MODERN PHOTO-ENGRAVING, technique of reproduction processes, 16 mm., C., Sd. (see also Kodak Ltd., p. 155).

Ethyl Corporation, 405 Lexington Avenue, New York, N.Y.

All films are 16 mm., Sd., and include: OIL FIRES, treatment of types of fires associated with oil, 35 min.; LOOKING AHEAD, progress of oil refinery technique and its relationship to the motor car, 25 min.; SLOW-MOTION STUDIES OF COMBUSTION, combustion fuels in engines, 25 min.; THE LONG ROAD, discovery of tetra-ethyl lead an "anti-knock" agent, 25 min.; WHERE MILEAGE BEGINS, manufacture of Chevrolet engines, 25 min.; SLOW MOTION STUDIES, circulation of coolant in a new-design hollowhead valve, 10 min.

Farm Journal, Inc., New York, and *S.R.F. Pictures.*

SINGING WIRES, electrification and its agricultural uses.

Film Publishers, Inc.

ONE WORLD OR NONE, animated film stressing fact that other nations also conducting researches on atomic energy; comparison of destruction by atomic bomb; produced in co-operation with the National Committee on Atomic Information, with the technical assistance of the Federation of Atomic Scientists.

Fleischmann Laboratories, Standard Brands Inc., 810 Grand Concourse, New York, 51, N.Y.

BUDDING AND SPORULATION OF YEAST, 16 mm., St., 375 ft., F.; HISTOLOGICAL STUDY OF DEGRADATION OF WHEAT STARCH, 16 mm., St., 400 ft., F.; ENZYMES IN DOUGH FERMENTATION, 1933, action of various enzymes of their substrates, relation between fermentation by yeast in dough, and diastatic fermentation.

Formica Insulation Co., Cincinnati, Ohio.

THE FORMICA STORY, manufacture and uses of laminated plastics, 16 mm., 45 min., C.

Ford Motor Co., Detroit.

SCIENCE RULES THE ROUGE, scientific control in manufacture, 20 min.

Frontier Bronze Corporation, Niagara Falls, N.Y.

A film on foundry technique, laboratory methods and applications of aluminium alloy. 16 mm., 30 min., Sd., L.

General Electric Co., New York.

THE MAGIC OF FLUORESCENCE, history of lighting up to modern fluorescent methods, 30 min., C.; CLEAN WATERS (1947), pointing

out the dangers of water pollution and the need for good sewage disposal methods, 16 mm., Sd. Elected one of the outstanding sponsored films, Festival of International Films, Chicago; R. or S.

General Motors Co.

On to Jupiter, a vision of to-morrow, and the role of science in its development, 20 min.

Goetze Gasket and Packing Co., New Brunswick, N.J.

Only a Gasket, 35 min., Sd., C., 16 mm., distributed by Hathen Productions (see p. 194).

Goodyear Tyre and Rubber Co.

An American Success Story; Synthetic Rubber, development and production of synthetic rubber, 18 min.

George Gorton Machine Co.

An Exact Duplicate, new techniques and tracer controlled machinery, 35 min., C.

Handy and Harman, 82 Fulton Street, New York 7, N.Y.

Handwrought Silver (1948), shows in colour the work of the silversmith, by a new personal technique, as if the viewer were himself the operator; distributed by their Craft and Service Department.

Kelvinator Co., 14250 Plymouth Road, Detroit 32, Michigan.

Surprise for Janie, a film for school and college use, and for adult education groups, describing uses of the home freezer in American family life, 16 mm., Sd.

Kennametal Inc., Latrobe, Pa., with *Pilot Productions*, Chicago.

A sound slide-film, on the importance of solid carbide blades in precision work; single frame, 35 mm., with electrical transcriptions.

Walter Kidds and Co., Inc., Belleville, New Jersey.

Fire and How to Fight It (1947), effective use of various types of portable extinguisher, 16 mm., Sd., 22 min., F.

Institute of Life Insurance, New York.

Search for Security (1946), history and operation of life insurance.

Lincoln Electric Co., 12,818 Coit Road, Cleveland, 1.

Design for Arc-welded Structures, cartoon presentation of early methods of joining structural members, and later methods, particularly arc-welding, with consequent improvements in design and structure, 16 mm., Sd., C., F.

McGraw Hill Book Co., Inc., McGraw Hill Building, 330 West 42nd Street, New York, 18, N.Y.

A series of text-book films produced for correlation with selected text books. Each series includes sound motion pictures, co-ordinated silent film strips, and a brochure describing the functions and uses of these. The four series so far produced are:

French and Svenson: Mechanical Drawing.

(*a*) A series of 7 films, INTRODUCTION TO MECHANICAL DRAWING (10 min); SHAPE DESCRIPTION, Pt. I (15 min); SHAPE DESCRIPTION, Pt. II (10 min); AUXILIARY VIEWS (20 min.); SECTIONING (10 min.); SHOP PRACTICES (10 min.); SIZE DESCRIPTION (10 min.).

(*b*) A film strip, 50 frames, stresses techniques and placement of dimensions in standard practice. For use in conjunction with the foregoing films.

French: Engineering Drawing.

(*a*) A series of 7 films: INTRODUCTION TO ENGINEERING DRAWING (10 min.); ORTHOGRAPHIC PROJECTION (20 min.); AUXILIARY PROJECTION (20 min.); OBLIQUE OR DOUBLE AUXILIARY VIEWS (15 min.); SECTIONING (15 min); SHOP PROCEDURE (15 min.); DIMENSIONING (20 min.). Purchase cost of series, £350.

(*b*) A film strip, about 50 frames, stresses techniques, choice and placement in standard dimensioning practice. For use in conjunction with the last-named film.

Teaching (to supplement Schorling's Student Teaching).

A series of 5 films: ORIENTATION TO TEACHING (15 min.); DIAGNOSING A MALADJUSTED CHILD'S DIFFICULTIES (18 min.); REMEDIAL TECHNIQUES FOR CHILD'S READJUSTMENT (20 min.); DISCIPLINE (20 min.); THE CLASS PROJECT (20 min.).

Diehl: Healthful Living.

A series of films: BODY CARE AND GROOMING (20 min.); PERSONAL HEALTH (10 min.); THE NOSE, THROAT AND EARS (10 min.); THE BODY FIGHTS DISEASE (15 min.); GROUP HEALTH (10 min.); THE STORY OF REPRODUCTION (20 min.), sale cost, $110; EMOTIONAL HEALTH (20 min.). Purchase cost of 5 films and filmstrip, $375.

Mallinkrodt Chemical Works.

ETHER FOR ANAESTHESIA, development and production of ether, advances in manufacture, purification and preservation, 16 mm., Sd.

Metropolitan Life Insurance Co., New York.

BE YOUR AGE, normal living for those with cardiac ailments, cineradiographic studies of heart action; FAMILY PORTRAITS, operations in Metropolitan.

New York City Cancer Committee, 130 E. 66th Street, New York.

THE LITTLE RED DOOR, detection and treatment of cancer, C., F.

Nichols Morris Corporation, 50 Church Street, New York, N.Y.

THE MILLER THAT USES ITS HEAD, analysis of Nichols miller from tool engineers' point of view, 16 mm., C., Sd.

Operadio Manufacturing Co., Dt. Charles, Ill.

Films and sound slide-films, including those for use with their teaching aid, the "Explainette 100".

Pacific Lighting Corporation, Los Angeles.

A film showing the laying of a thirty-inch Gas Pipeline from the gas fields in Texas to Los Angeles.

Pictorial Films, Inc., New York.

Home and educational motion pictures, also industrial films, in 8 and 16 mm.

Public Service Co., Northern Illinois.

A motion picture showing Poultry Farming Methods in Northern Illinois, adapted for small farms, those up to 300 birds, and those with several thousand birds.

Quincy Compressor Co., Quincey, Ill.

Our Industrial Air Power, 16 mm., 25 min., Sd., C., F.

R.C.A. Victor, New York.

Unseen Worlds, the R.C.A. Victor Electron Microscope.

Republican Aviation Corporation, Farmingdale, New York.

Rohm and Haas Co., Washington Square, Philadelphia, Pa.

Looking Ahead through Plexiglas (1947), manufacture and applications of acrylic plastic, 16 mm., Sd., C. in part, F. in United States.

A Thunderbolt is Made, manufacture of a P 47, 16 mm., 30 min., Sd.

A. F. de Samo, Co.

Speed in Cutting, use of abrasive cutting-off machines, 16 mm., 20 min., Sd., distributed by Hathen Productions (see p. 194).

W. A. Sheaffer Pen Co.

The Twenty-six Old Characters, a pictorial presentation of the evolution of the written alphabet, and of methods of writing. Made by the Jam Handy Organisation.

Shell Oil Co., 50 W. 50th Street, New York 20, N.Y.

Prospecting for Petroleum, tracing oil formation within the earth, and its discovery in 1859 at Titusville, Pa.; Lubrication of Turbine Systems (produced for Navy Department, Bureau of Ships), 16 mm., 30 min., M., Sd.; Birth of an Oil Field, 16 mm., Sd. C. All F.

Society for Visual Education, Inc., 100 E. Ohio Street, Chicago 11, Ill.

Makers of equipment, films and film strip; large library of educational visual material including scientific topics. *Publication.*—1947 *Educational Film Strip Catalogue; Visual Review* 1947.

F. J. Stokes Machine Co., Philadelphia.

Robots at Work, automatic moulding of thermosetting plastics, 35 min., Sd., C., 16 mm.; There is an Engineering Reason, manufacturing operation and application of steam auxiliaries, 16 mm., 35 min., C. Distributed by Hathen Productions (see p. 194).

Texas Gulf Sulphur Co.

SULPHUR, production operations and utilisation. Dist, Bureau of Mines Expt. Station (see p. 183).

The World Today, Inc., New York.

During 1947 made 14 documentary and factual films, including WONDER EYE, treatment of the motion picture camera; ROUND TRIP, foreign trade and the U.S.A.; LIFE-LINE, European reconstruction; WE SEE THEM THROUGH, on rheumatic fever; STARTING LINE, care of premature infants.

Future programme for production includes musical topics and agriculture.

Transworld Airline, Washington, D.C.

FLIGHT TO THE SUN, the American South West, 16 mm., 4 reels, 40 min., obtainable F. for return mailing charges, from Institute of Visual Training, 40 E. 49th St., New York, 17.

Underwood Corporation, New York.

THE DUTIES OF A SECRETARY.

Union Oil Co., California.

ANNUAL REPORT, 1948, a 22-minute film describing the company's work.

Vermont Marble Co., Proctor, Vermont.

Yale and Tourne Manufacturing Co.

IT'S YOUR MONEY, modern methods of handling material, 16 mm., 35 min., Sd.; distributed by Hathen productions (see p. 194).

Yarnall-Waring Co.

MAKING STEAM TRAP HISTORY, engineering research in thermodynamics, 16 mm., C., distributed by Hathen Productions (see p. 194).

(4) DISTRIBUTORS.

Akin and Bagshaw, Inc., 2023 E. Cotfox Avenue, Denver, Col.

American Museum of Natural History, 79th and Central Park West, New York, N.Y.

Bell and Howell, Co., 1801 Larchmont Avenue, Chicago, 13, Ill.

British Information Services, 30 Rockefeller Plaza, New York, 20, N.Y.

Catalogue of 16-mm. Sd. films includes scientific and technical subjects.

Castle Films, Inc., 20 Rockefeller Plaza, New York, 20.

Distributors of films made for various departments of the U.S., including U.S. Office of Education. The completed programme of the Division of Visual Aids for War training includes 466 sound motion pictures and 432 film strips, in the following subjects: Automobiles 19 titles; Suspension, 17; Disabled Workers, 19;

Electronics, 4; Metallurgy and Materials Testing, 10; Mechanics, 9; Refrigeration, 15; Woodworking, 20; Foundry Practice and Pattern Making, 35; Plastics, 14; Welding, 5; Airplane Maintenance, 36; Machineshop Work, 125; Agriculture, 57.

Catalogue 1947, 36 pp.

Films issued are accompanied by manuals, 12–16 pp., and filmstrips; all 16 mm., M., Sd., St. (films) and 35 mm., Sd., St. (filmstrips).

College Film Centre, 84 East Randolph Street, Chicago 1, Ill.

Coronet Films.

Creative Educational Society, Coughlan Building, Mankato, Minnesota.

Eastman Kodak Co., 343 State Street, Rochester 4, New York.

Distributors of "Index of Training Films", compiled by *Business Screen*, which lists some 1,700 motion pictures and slide films; 104 pp., free. For films, see p 189.

Eastman Kodak Stores, Kodascope Libraries Division, 356 Madison Avenue, New York, 17, N.Y.

Encyclopædia Britannica Films, Inc., 20 North Wacker Drive, Chicago, 6, Ill.

Makers and distributors of films for rent or sale, 16 mm., Sd. and St., M., and C. *Catalogue* covers subjects such as the following: Physics, 17 titles; Chemistry, 6; General Science, 30; Human Biology, 16; Health Hygiene, 7; Earth Sciences, 3; Zoology, 20; Botany, 9; Primary Science, 14; and many others on subjects such as Geography, Social Studies, Home Economics, etc.

Films, Inc., 125 W. 45th Street, New York City, N.Y.

Films of Commerce, 21 W. 46th Street, New York, N.Y.

Hathen Productions, 264, S. Van Pelt Street, Philadelphia 3, Pa.

Ideal Pictures Corporation, 1,600 Broadway, New York City; 38 E. 8th Street, Chicago, Ill.

International Films Bureau, Inc., 84 East Randolph Street, Chicago, Ill.

Mexico Supply Co., Albuquerque, New Mexico.

Modern Talking Pictures Service, 9 Rockefeller Plaza, New York, 20, N.Y.

Museum of Modern Art, New York. Director of Film Library, Iris Barry.

Official Films, Inc., 330 W. 42nd Street, New York City, N.Y.

Pacific Lighting Corporation, Los Angeles.

LAYING A GAS PIPE-LINE, a film showing the laying of a 30-inch gas pipe-line from the Texas gas fields to Los Angeles, 16 mm., M.

Rutgers Films, Box 78, Rutgers University, New Brunswick, N.J. See also p. 185.

Textile Research Institute, 10 E. 40th Street, New York.

BIRTH OF A RAYON STAPLE FIBER PLANT (PB 67563) showing large-scale conversion of straw to viscose rayon in a German rayon plant; obtained by the Office of Technical Services, and English titles added.

United World Films, Inc., 445 Park Avenue, New York.

Distributors of ATOMIC PHYSICS (Gaumont British), see p. 153.
Castle Films Division, see p. 193.

Stark Films. Howard and Centre Streets, Baltimore, Md.

Wholesome Film Service, Inc., 20 Melrose Street, Boston, Mass.

Y.M.C.A. Motion Picture Bureau, 347 Madison Avenue, New York City, N.Y.

(5) PERSONAL DIRECTORY.

Brandon, T., President, New York Film Council, 1600 Broadway, New York, N.Y.

Dale, E., Chairman, Audio-Visual Committee, National Congress of Parents and Teachers, School of Education, Ohio State University.

Keeslar, O., Director, Teaching Aids Library, State of California, 1514 K Street, Bakersfield, California.

Interested in film as form of science teaching methodics; publications in *Science Education* (see p. 9); book in preparation on *The Film in Education.*

Klemmo, Dr. R., Department of Surgery, University of St. Louis.

SURGICAL TREATMENT OF PARKINSON'S DISEASE, in colour; PALSY, in colour.

Lindstrom, Dr. C. A., Chief of Motion Picture Service, U.S. Department of Agriculture, Washington, D.C.

McNulty, Miss L., Consultant, Visual Education Department, Louisville Board of Education, Louisville, Kentucky.

Morton, Dr. H. E., Chairman, Visual Aids Committee, American Society of Bacteriologists; Editor, Section on Visual Aids in Microbiology, Innumology and Public Health, Biological Abstracts; School of Medicine, University of Philadelphia.

Peterson, Prof., University of Minnesota, Department of Animal Husbandry.

MILK PRODUCTION IN THE COW, in colour.

Stenius, Dr. A., Director, of Visual Education, Detroit Public Schools, Detroit, Michigan.

Walton, Dr. R. P., Medical College, South Carolina, Charleston.

Compiled, with colleagues, list of Pharmacological Films and Film Strips.

Wittich, Dr. W., Director, Bureau of Visual Instruction, University of Wisconsin, Madison, Wisconsin.

(6) FILMS.

Operation Crossroads, U.S. Navy, see p. 183.

Mechanical Drawing, McGraw Hill, see p. 190.

Modern Photo-Engraving, Eastman Kodak, see p. 189, and Plate IX.

Gulf of Mexico Invertebrates, Rutgers Films, see p. 185, and Plate IV.

Atomic Energy, *Encyclopædia Britannica*, see p. 194, and Plate XXXIV.

One World or None, Film Publishers, Inc., see p. 189.

Seeds of Destiny, dealing with destitute and undernourished children of Europe and Asia, 16 mm., received Academy award as best documentary of 1946, distributed by Films of the Nation, Inc., New York.

(7) BOOKS.

American College of Surgeons: *Medical Motion Picture Films* (1946), Bulletin of American College of Surgeons, 40 E. Erie Street, Chicago 11, Ill., pp. 1–44.

American Council on Education: *Projecting Motion Pictures in the Classroom*, Publication No. 5, 1940, 118 pp.; *Motion Pictures in Modern Curriculum*, Publication No. 6, 1941, 179 pp.

American Standards Association: *Size of Projection Screens*, American War Standard, z52.41–1945; *Whiteness of Projection Screens (Semi-diffusing Reflecting Surface)*, A.W.S. z52.45–1945; *Method of Determining Noise Level of Motion Picture Cameras*, A.W.S. z52.60–1945; published by American Standards Association, 70 E. 45th Street, New York, 17, N.Y. 25 *c*. each.

Brunstetter, M. R.: *How to Use the Educational Film*; University of Chicago Press, Chicago, 1937. 156 pp.

Business Screen: *Index of Training Films*, 2nd Edition, 1947. A list of over 2,000 industrial motion pictures and slide films and their sources, for reference and training in industry and vocational education, 128 pp., free; distributed by Eastman Kodak, Rochester 4, N.Y. *Projectionists' Handbook*, 1946, $1.00, Business Screen Magazine, 157 E. Erie Street, Chicago 2, Ill.

Clarke, E. C.: *Use of Visual Aids in Teaching*, 24 pp., 25 *c*., published by Educational Screen, 64 E. Lake Street, Chicago, Ill.

Dale, E., Dunn, F., and Hoban, C. F.: *Motion Pictures in Education: Summary of the Literature*, 472 pp., H. W. Wilson, Co., New York, 1937.

Educational Film Guide, H. W. Wilson Co., New York, 1946.

Exton, W., Jr.: *Audio-Visual Aids to Instruction*, McGraw Hill Book Co., New York, 1948. $4.00.

Keeslar, O.: *Contributions of Instructional Films to the Teaching of High School Science*, Science Education, March, 1946, 30, 2; and April, 1946, 30, 3, pp. 1–11.

Morton, H. E.: *The Use of Visual Aids in the Teaching of Medical Bacteriology*, Journal of the Association of American Medical College, March, 1946, pp. 1–4.

Rulon, P.: *The Sound Motion Picture in Science Teaching*, 1933, Cambridge, Mass.

Sanitation Research Foundation: *Visual Aids for a Sanitation Programme*, vol. 1, No. 2, Sept., 1946; a source list of about 50 films and film strips, with additional reference lists; Box 240, Louisville, Kentucky.

(8) PERIODICALS.

American Cinematographer,

Biological Abstracts. Editor, J. E. Flynn, University of Pennsylvania, Philadelphia, 4. Contains sectional abstracts on material for visual instruction in microbiology, immunology and Public Health. Editor, H. E. Morton; Chairman, Committee on Materials for Visual Instruction in Microbiology, American Society of Bacteriologists. Published 10 times yearly, $27.50.

Business Screen, 20 North Wacker Drive, Chicago, $2.00 yearly; industrial and training film magazine.

Classroom Film, Teaching Films Division, Eastman Kodak Co., Rochester, 4, New York; free.

Educational Screen, published by Educational Screen Ind., Pontiac, Ill., $2.00 yearly, $3.00 foreign. Editor, J. Dugan.

Film Forum Review, (1946), Institute of Adult Education, Teachers' College, Columbia University, New York, 27, N.Y.; occasional issue.

Film News, Film Centre, 30 Rockefeller Plaza, New York.

Hollywood Quarterly, 350 Royce Hall, University of California, Los Angeles, 24; quarterly, $4.00.

International Photographer.

Journal of Society of Motion Picture Engineers.

Naved News, published by National Association of Visual Education Dealers; vol. iv, No. 1, November, 1946, is a directory of 264 accredited dealers. President, B. Cousino.

Science Illustrated; began in March 1948 a service of information entitled "Science on Film". New York.

Scientific American, published by Munn and Co., Inc., 24 W. 40th Street, New York, 18, N.Y. President, Orson Munn; occasional material on scientific films.

See and Hear, Audio-Visual Pub. Inc., 157 E. Erie Street, Chicago. $3.00.

Victor Newsreel, Davenport, Iowa, Victor news in the 16-mm. field. Free.

Visual Review, published by Society for Visual Education, Inc. 100 E. Ohio Street, Chicago, 11, Ill.; annually, free.

URUGUAY

(1) OFFICIAL ORGANISATIONS.

Ministry of Public Instruction, Cinematography Section.

Has made short films of Uruguayan life and culture.

There is some amateur activity in the 16-mm. field, but so far no strictly scientific films have been made.

VATICAN CITY STATE

(1) OFFICIAL ORGANISATIONS.

There is official activity in film production, but so far as is known no scientific films are being made.

VENEZUELA

No information.

YUGOSLAVIA

(1) OFFICIAL ORGANISATIONS.

Cinema Commission, Prime Minister's Office. Chairman, M. Alexander Vuco. Organisation of mobile cinemas; five educational films planned for 1948 production in Zagreb.

(3) FILM MAKERS.

Zvezda-Film, Belgrade. Nine titles of documentary 35-mm. films, including the following: NEW VICTORIA, physical culture in the Army and Navy, 1,075 m.; YOUTH'S RAILWAY, work of the Youth Working Brigade on Youth's Railway, 1,310 m.; TYPHUS RAGED, formation of working units in anti-typhus campaign, 391 m.

Triglav-Film, Ljubljana. YOUTH REBUILDS, Slovene youth working brigades for rebuilding the country, 35 mm., 514 m.

Jadran-Film, Zagreb. Six titles, documentary, 35 mm.

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INDEX OF FILM SUBJECTS

(The films listed below are classified according to the Universal Decimal System; an abridged list of subject headings is published by the British Standards Institution, London, B.S.1000A: 1948, 25s.)

67. *Manufacture of Simple Materials*